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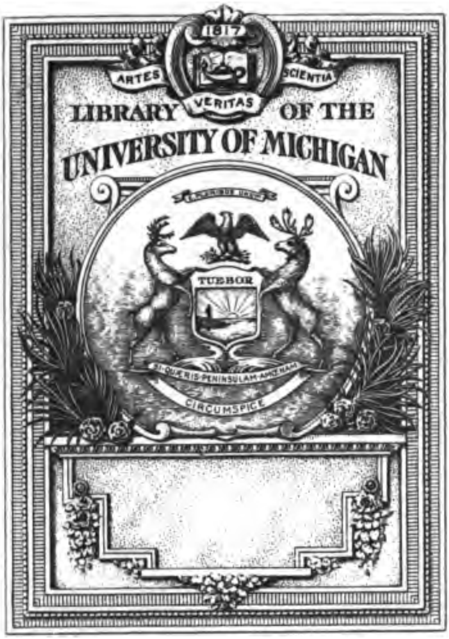

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SANITARY ENGINEERING
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Third Biennial Report

(New Series)

OF THE

M[illegible]

State Board of Health

And Vital Statistics

OF MINNESOTA

SANITARY ENGINEERING DIVISION.

1909-1910

SYNDICATE PRINTING CO.
Minneapolis, Minn.
1911

Office of the State Board of Health
and Vital Statistics.
St. Paul, Minn., Dec. 31, 1910.

To His Excellency, A. O. Eberhart, Governor:

Sir: In accordance with the law which requires that the Minnesota State Board of Health "shall report its doings and discoveries to the legislature at each regular session thereof, with such recommendations as it shall deem useful," I herewith submit to you a report of the years covering 1909-10.

Respectfully submitted,
H. M. BRACKEN, M. D.,
Secretary and Executive Officer.

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Members of the Minnesota State Board of Health and Vital Statistics

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*Died Dec. 1st, 1910.

PREFACE.

In the early history of the Board, biennial reports were made, but the expense for same was paid out of the funds of the Board. The last biennial report issued in this way was that presented at the close of 1902, the Nineteenth Report on Infectious Diseases of Men, and one completing the work of infectious diseases among animals under this Board's supervision from August, 1900, to May 1, 1903. From that time on no report was published on account of lack of funds, until the legislature of 1907, when a small report was submitted to the legislature, as provided for under the Revised Statutes of 1905.

SANITARY ENGINEERING DIVISION.

Introduction.

The work of the Minnesota State Board of Health has rapidly increased from year to year. The Board was first organized in 1872. From that time until the spring of 1894 its office was in Red Wing, Minnesota, and its entire force consisted of the executive officer and three clerks for office work, one to look after the vaccine station and one assistant in the chemical laboratory. The Board first occupied rented rooms in the Pioneer Press building, St. Paul, after its removal from Red Wing, but in addition Dr. Hewitt, the then executive officer, maintained a laboratory on the university campus, he himself conducting the bacteriological work and having an assistant who conducted largely the chemical work.

In January, 1896, Dr. F. F. Wesbrook, Professor of Pathology and Bacteriology of the University of Minnesota, was made bacteriologist to the Board, his duties being to examine specimens of diphtheria and tuberculosis and report such examinations to the secretary. Dr. Hewitt still kept charge of the chemical work.

In 1897 Dr. H. M. Bracken became the executive officer and Dr. Wesbrook was made Director of the Bacteriological Laboratory. When Dr. Hewitt discontinued his work with the Board, Charles Bell, M. A., Professor of Chemistry in the College of Medicine and Surgery of the University of Minnesota, was asked to take charge of chemistry on the same basis that Dr. Wesbrook had charge of bacteriology, but he refused the opportunity and suggested that Mr. H. Carel should do the work under his supervision; and the chemical work was continued under Mr. Carel until 1903.

The supervision of the vaccine station by the Board was discontinued January, 1897.

The control of infectious diseases of animals which had been under the State Board of Health from 1885 was by act of the legislature discontinued in 1903, the work being turned over to the newly-organized Live Stock Sanitary Board.

In 1889 the Board employed a sanitary engineer from time to time as needed. This method of securing an engineer was continued until 1906, when Professor F. H. Bass of the University Engineering Department was employed on part time.

In 1907 the legislature provided for a pasteur institute under the supervision of the State Board of Health, and this, since opening, has been under the charge of Dr. O. McDaniel.

In 1905 a branch laboratory was established at Duluth, the state paying for part of its maintenance, Duluth and St. Louis county contributing. Dr. E. L. Tuohy has been in charge of this laboratory since its opening.

In 1907 special work was begun in connection with the suppression of tuberculosis.

Dr. Hill was made epidemiologist to the Board of 1909. In April, 1910, a Division of Epidemiology was created and Dr. H. W. Hill was put in charge.

During all the years since 1887 vital statistics have been cared for under the direction of the executive officer. Reports were published relating to vital statistics until 1897, when, by act of the legislature, the expense of publishing same through the state printer was discontinued and, as with the biennial reports, the Board being without funds, it was unable to continue publication of the vital statistic records. No reports have therefore been issued since 1897.

During all these years the work of the Board has been steadily increasing. This work has been carried on as follows:

1. Executive duties under the secretary;
2. Vital statistics under the secretary as state registrar;
3. Laboratory work, including the branch laboratory at Duluth and the Pasteur institute, under supervision of a director;
4. Epidemiological work under the supervision of a director;
5. Engineering work under the supervision of a director.

The work of the Board is governed by the Revised Laws of 1905 and by various laws passed since that date. The Board also directs its operations under certain regulations framed by it, as provided for in the Revised Statutes of 1905, section 2131.

Public health work is not limited to that outlined above, but extends into various other departments of the state, such as the Dairy and Food Department, Infectious Diseases of Animals, the Labor Bureau, etc., etc.

Public Health Work: More attention should be given to public health matters. It should be made possible for a considerable number of men to devote their entire time to this work. To accomplish this, a liberal appropriation from the state must be made. To secure the greatest benefit from such state appropriation an active local interest in public health affairs should be secured, and this might be accomplished by legislative action that would furnish state aid to a district in the event of its meeting certain general requirements. For example, a district might receive state funds, to aid in the payment of a trained public health official on condition that a certain amount was set aside by the district to aid in this work. A precedent for such a course already exists in Minnesota in connection with the educational work of the state.

Governor Eberhart has stated: "The development of the best sanitary conditions to insure public health must be considered and agitated in order to give force to a state-wide movement for the development of Minnesota. How best the public health may be protected, is a question deserving ample discussion, to the end that a broader and more intelligent view of those subjects may be had."

Such words, coming from the chief executive of the state, are most encouraging. Public health problems belong to the people, and when the leaders of the people recognize this fact there is hope.

Civilized people are coming to a realization of the fact that disease constitutes a great bar to human progress. Not only those who suffer from disease are affected, but the disease of the parent reaches the child, both by heredity and through the direct influence upon mental and physical development.

A great state that is considering such questions as the conservation of its forests, its water powers, its mines and other problems involving financial prosperity, cannot afford to pass lightly those relating to conservation of human life. Over twenty-four thousand human beings die annually in Minnesota, and of this number nearly half die of preventable diseases. During 1908 and 1909 the deaths from preventable diseases were as follows:

	1908	1909
Tuberculosis	2,161	2,306
Pneumonia	1,877	1,755
Diarrhoeal diseases of children	1,291	1,353
Cancer	1,259	1,226
Diphtheria	574	557
Typhoid fever	370	393
Scarlet fever	117	244
Anterior poliomyelitis	9	234
Whooping cough	162	192
Puerperal sepsis	117	73
Measles	87	30
Tetanus	17	23
Smallpox	32	16
Trichinosis	.....	2
Rabies	2	1

This is simply appalling and represents a cash loss of many million dollars. Even this, however, is but a drop in the bucket, for these deaths represents a total number of recovering or living cases as follows:

	1908	1909
Tuberculosis	8,644	9,224
Pneumonia	13,765	12,870
Diarrheal diseases of children	24,529	26,106
Diphtheria	5,166	5,013
Typhoid fever	8,880	9,432
Scarlet fever	2,223	4,636
Anterior poliomyelitis	36	936
Whooping cough	3,888	4,608
Measles	2,813	970
Smallpox	6,215	1,238

Considering the loss of time to the wage-earner, the cost of medical care, nursing and medicines, the demoralization of business, impaired physical condition, etc., we have an additional loss of many million dollars. These points are made, not because the cash value of human life is to take precedence over altruistic considerations, but rather because we can comprehend the immensity of the problem as considered from the money side, while the altruistic side is simply beyond comprehension. To these deaths from preventable diseases must be added those from other preventable causes, such as accidents and injuries, and even the deaths not directly assigned to a preventable cause, but due to improper housing in the home, the school room, the workshop and the factory. With such facts before us, can we ignore the importance of conserving human life?

Preventable diseases can be prevented. To accomplish this great undertaking, there must be an abundance of people who make this their life work, sanitary officials, medical school inspectors, nurses, teachers, etc. There must also be thoroughly equipped isolation hospitals, i. e., places to which people will gladly go, thus doing away largely with the need of home quarantine. All of this means money. A half million dollars annually is not too large a sum for the state of Minnesota to spend in order to stop the loss of millions of dollars resulting from deaths and sickness due to preventable diseases. The old adage "An ounce of prevention is worth a pound of cure" was never more applicable than in dealing with preventable diseases.

Every county needs at least one whole-time sanitarian and several local nurses. A permissive law should be passed allowing communities to take up this important work. State aid should be given to such communities as an aid to their laudable undertaking.

Still further, existing organization should work together. A large part of the labor problems are of a public health nature. The development of the child during school life is in great measure a public health problem. The purity of food-stuffs is beyond doubt a public health question. The transmission of infectious diseases from animal to man is a public health question. The great sociological problems of the day are to a certain extent public health matters. Why then should there not be a unity of all these interests under a permanent commission having bureaus covering the various special lines of work? Much has been said of late about a National Department of Health, and it has been suggested that the federal government provide a Department of Health, Education and Labor. These three lines of work truly belong together. Why not create in Minnesota a department covering at least these three vital divisions?

Strange as it may seem, sentimental and humanitarian arguments are of little avail in dealing with legislative bodies; yet it is to these bodies that we must look for the funds to carry out the conservation of human life. It is the almighty dollar that talks. A commercial problem will receive prompt attention, as evidenced by the large sums of money spent through our national and state governments in dealing with the preservation of the life of animals.

If we must reduce a problem to a commercial standard before it can receive proper legislative action, submit to some statistician the question as to the cost in dollars, of sickness and death, direct and indirect, resulting from preventable causes, and he will quickly show you the value of human life and the loss to our state annually through such deaths. It is estimated that the actual loss to this state, through one disease alone, tuberculosis, was over $23,000,000 for the years 1906 and 1907; and this loss did not take into account the cost of disease, nor the deterioration in earning capacity, in after years, of the children of deceased. With this as a basis, estimate if you can the yearly financial loss to the state, through death alone, from the several preventable causes already referred to.

How are we to meet this condition, and bring about the conservation of human life? By educating the people as to actual facts and through co-operation of the many agencies interested in the protection of human life. Such co-operation should be between federal and state agencies; between educational and sanitary bodies; and between executive bodies dealing with public health problems from different standpoints. Co-operative work has already been carried on, from time to time, between certain federal departments and the Minnesota State Board of Health, in the study of the waters of the state. Co-operative work is now being carried on between certain educational bodies and the State Board of Health, but this should become more general. Every school child should be taught the simple elements of sanitation. Every high school graduate, every agricultural school graduate, every normal school graduate, every college and university graduate, should go out into active life with a training in sanitation that would enable him or her to take a prominent place as a conserver of the public health.

But we may be more specific. We should find the state departments of public health, of foods, of animal diseases, all working together as conservers of human life. So closely interwoven should such departments be that it would not be amiss to create a Department of Public Safety for the state, embracing these four divisions. The state has accepted the commission plan for dealing with railroads and warehouses, with taxes, banking, etc. Why should it not have a commission to govern such a Department of Public Safety?

Such commission should be in continuous session, as are the other state commissions. It should be made up of men familiar with the different problems involved. The commissioners should be appointed for the longest possible terms, and should be eligible to reappointment; for the greater the experience, the greater the value of the expert. Such a commission would economize in every way for the state. Its inspectors would be looking after many things, rather than for single faults, as they traveled over the state. Such a commission should be housed in a building of its own, with proper laboratory facilities.

It is my opinion that the legislator who is wise enough to create, in this state, such a commission, with suitable provisions for wise appointments and sufficient equipment, would pass into history as a benefactor, not only to his own state, but also to other states; which, seeing the wisdom of his action, should adopt through their legislators his ideas.

PREVENTABLE DISEASES.

In work relating to public health, the first thing to attract the people is that of preventing disease. In times gone by great attention was given to the group of so-called contagious diseases; such as smallpox scarlet fever and, later, diphtheria, and an attempt was made to limit their spread by means of quarantine. With the advance in medical knowledge other diseases have been found to belong in the preventable group. With known cause and prevention quarantine has not been demanded for these, and therefore has not kept pace with the increase in the number of diseases recognized as preventable. In fact, it is now known that quarantine can to a large extent be done away with if certain simple means of preventing disease are carried out.

To the three diseases mentioned above belonging in the so-called contagious group should be added measles and whooping cough, as deserving of control but not demanding quarantine. The preventable disease list includes tuberculosis, typhoid fever, epidemic anterior poliomyelitis, certain diarrhoel disease of children, puerperal septicemia, pneumonia and certain forms of bronchitis. Quarantine is not considered necessary for any of these; yet it is a well-recognized fact that there may be and will be contact cases for all if the disease is not properly handled. Quarantine for diphtheria still prevails in spite of our knowledge of how it is spread. If proper means were taken in dealing with the carriers of the germs of this disease quarantine could be discontinued entirely. It is a well-recognized fact that quarantine after the old methods is no longer necessary in dealing with smallpox, for this disease is easily controlled by a preventive measure. It is also well known that where this preventive measure is not used the spread of smallpox is not controlled by quarantine, for the simple reason that there are always many mild or unrecognized cases which do not come under the control of health officers and therefore spread the disease. We are practically, then, in the position of saying that only one disease still demands quarantine as a means of preventing its spread; viz., scarlet fever, and even here it is a question if quarantine avails much. Among the best observers it is now well known that the chief danger from scarlet fever. as the disease advances, is not from the patient or the patient's clothing in general but from special discharges of diseased parts; viz., specific discharges from the ears or from the nose, of those who have the disease or who have recently recovered from it. It is now conceded that the infection even from this latter type of scarlet fever patients is not carried through the air.

As to aerial infection, this may now be limited practically to smallpox, chicken pox, measles and whooping cough, and even in these the infection can not be carried far. For example, it has been demonstrated that upon the appearance of chicken pox in a ward, if the patients in the beds adjoining the chicken pox patient and the chicken pox patient are removed from the ward, the disease will spread no further. In other words, it is known that the aerial infection of chicken pox in hospital wards is carried only to the patients in the adjoining beds. The same will hold true for smallpox. With measles and whooping cough the aerial infection is probably no greater than for tuberculosis, but this infection depends upon the extreme coughing of the patients, thus diffusing the contagium into the air of the room with the fine spray expelled from the mouth in the act of coughing.

Admitting the above facts, what is to be the policy in the future in dealing with the so-called contagious and infectious diseases? It must be recognized that quarantine if properly carried out is not only a great expense to the municipality but also a great expense to the individuals quarantined. A recent newspaper gave a father's estimate as to the cost of a single case of scarlet fever in his family and his estimate was made on a very conservative basis. It was as follows:

For physician	$37.50
For nurse	45.00
For drugs	25.00
For food	15.00
Destruction of infected clothing	25.00
Disinfection	5.00

As against this cost he put on the other side "**Prevention**" and figured as follows:

One ounce of prevention	$0.00
One share of expense in establishing sanitary drinking fountains in schools and elsewhere	.10
One share in service of a doctor to guard against disease, per annum	3.00
One share in maintaining good drinking water in the city	.07
One share in maintaining tuberculosis hospitals	.26

The total cost of prevention was $3.43 as against the cost of one case of scarlet fever, $152.50. But this applies to a man living in the city. The cost of scarlet fever to the man living on the farm is even greater for he must pay mileage to his doctor and he must lose the sale of dairy products during the sickness in his household. It would be hard to estimate the total cost as the result of quarantine per annum in the state of Minnesota, but it may be safely said that it runs into millions of dollars.

The alternative for quarantine is isolation of the infected individuals. This is difficult in the home as a rule but it is not difficult to carry out if proper isolation hospitals are maintained. The treatment of surgical cases in hospitals is becoming very general and the knowledge of infection is the cause, for it is now conceded generally that in a well equipped hospital a surgical operation can be carried out and the patient have much greater chance of recovery without infection of the wound than is possible in the home. Here the patient is taken from the home because of the danger of infection in the home. With preventable diseases the patient should be taken from the home in order to remove the infection from the home.

The hospitals maintained for the care of surgical cases must be of high standard so far as relates to cleanliness, etc. They are no longer repellent like the hospitals that were maintained one hundred years ago to care in the most indifferent way simply for those who had no homes. There should be isolation hospitals thoughout the state of as good type as the hospitals now maintained for the handling of surgical cases and all possible preventable diseases should be taken to these institutions. Any city or village having a population of 5,000 and upwards should have a well-equipped isolation hospital which should serve not only for the municipality but also for the district extending ten miles into the country. Using such district as a sanitary unit, the expense of constructing and maintaining a hospital would be nothing as compared with the expense involved in the handling of preventable diseases in the homes throughout that same district covering a similar period of time. The larger cities should, of course, maintain hospitals for the care of preventable diseases purely for their own accommodation, but at the same time these hospitals might be sufficiently large to accommodate people from the surrounding rural district. In countries fully recognizing the importance of isolation hospitals one bed in such hospital is considered necessary for each 1,000 of the population, but it has been found that with the installment of such hospitals in semi-rural districts and in the smaller municipalities the amount of preventable disease is actually diminishing and as a consequence not so many beds will be needed in the future as are needed now.

In large cities the isolation hospital should be located where there is an abundance of land, so as to permit convalescing patients to be in the open air. In the large cities isolation hospitals should be built on the pavilion plan but for smaller cities and for a semi-rural district an isolation hospital may well be built on what is now known as the cubicle plan.

Recognizing the fact that a large percentage of the spread of preventable diseases is now by contact of patients with others, it must be seen that in the hospital the nurses and the physician are the ones upon whom rest the opportunities for the spread of the diseases. It has been well demonstrated that the same nurse taking proper precautions may care for patients suffering from different diseases in a ward built on the cubicle-system plan without any cross infection, but this nursing of different diseases by the same nurse cannot be carried on satisfactorily in a pavilion ward.

It is time that the State of Minnesota was making provision for sanitary districts, surrounding a certain point, such as a village or city, rather than continuing the township or village or city as the unit; and it is to be hoped that the present legislature will take note of this need.

Isolation hospitals are especially needed in dealing with tuberculosis and typhoid fever, for it is almost, if not quite, impossible except in the families of the wealthy to prevent the spread of infection from patients suffering from either of these diseases to other members of the household. Such hospitals are very necessary in the handling of scarlet fever and diphtheria, for it is comparatively easy to control both of these diseases if the diseased individuals are removed from the home. Tuberculosis and diphtheria are comparable in the methods of infection, for in both the infectious material is carried in the discharges from the respiratory tract, practically the only difference being that one is a chronic disease while the other is a very acute disease.

While speaking of these preventable diseases and their control it is well to impress upon the people that tuberculosis is a communicable and a preventable disease and that it belongs with other diseases of this group, not in any special class by itself. The only excuse for the great campaign against tuberculosis during the past few years is the ignorance and indifference relative to this disease in the past. Knowing as we do its cause and the mode of prevention, tuberculosis should be regulated and cared for the same as any other preventable disease.

While abroad last summer I made it a point to study certain problems connected with isolation hospitals and these are set forth in the following report.

BRIGHTON: The isolation hospital at Brighton is beautifully located on high ground and well arranged. It consists of an administrative block, a disinfecting station, a laundry, a small destructor and four main pavilions for infectious diseases divided as follows:

(a)—Scarlet fever pavilion (two stories) 68 beds;
(b)—Consumption pavilion (two stories) 56 beds;
(c)—Diphtheria pavilion 22 beds;
(d)—Isolation pavilion 14 beds.

The total number of beds is 160. The population of Brighton is estimated for 1910 at 131,900. The proportion of beds to the population, therefore, is 1 to 800

This represents the general type of isolation hospital in England, with provision for different diseases in different wards or pavilions. When Dr. Arthur Newsholme was medical officer of health of Brighton he introduced the special feature of providing for consumptive patients at this hospital. The intent was not to keep patients for a long time with the idea of bringing about a cure, but rather to care for the patients a limited time for the purpose of educating them as to how they should take care of themselves and also of preventing the infection of others when they returned to their homes. More will be said of this system of care for consumptives when the general subject of tuberculosis is reported upon.

EDINBURGH: On August the 26th, I visited the so-called "fever hospital," the common term for hospitals for infectious diseases in Great Britain.

The hospital is beautifully situated on a tract of seventy acres. It is built on the pavilion plan, each pavilion being two stories high It consists of administration buildings, kitchen, domestic quarters, nurses' home and the various pavilions. Provision is made for the care of 600 patients; and this for a city with less than 400,000 population. The maximum number of patients at any one time so far has been about 500. The pavilions in a general way are divided into two groups. Originally one group was intended for scarlet fever and the rest for the remaining diseases but within a comparatively recent date one of these scarlet fever pavilions (the extreme or outermost one) has been given over for the care of incurable tuberculosis cases. The lower ward is for males; the upper for females. More will be given bearing upon the care of consumptives at this fever hospital. In the second group of pavilions, cases of typhoid fever, diphtheria, measles, whooping cough, erysipelas, cerebro-spinal meningitis, etc., are provided for. The wards are very roomy, there being about 2,000 cubic feet per patient. They are well lighted and heated by steam. The floors of the wards are of hard wood laid on cement. The pavilions are connected with each other to some extent, and with the administrative building, by means of creosoted wooden covered ways.

Of the scarlet fever cases about one-third are released within six weeks. The long cases bring the average up to about forty-eight days. There are very few "return" cases, and these are among those that have had discharges from nose or ears supposed to be cured at the time of release. The scarlet fever patients are not released while peeling, but this is because of the need of yielding somewhat to popular demand rather than because of any belief on the part of the physicians that the disease is spread by the desquamated material.

The kitchen in connection with this hospital is well planned and well equipped. The ceiling extends into the roof.

The nurses serving this hospital give their whole time to the institution. In fact, there is a school for the training of nurses. Dr Ker informed me that this hospital represents the general type of such institution of modern construction throughout Great Britain.

In connection with the hospital is a well-built but inconspicuous automobile ambulance upon which there is nothing to indicate its nature—no name or lettering of any kind.

PARIS: I had been told before leaving home that all infectious diseases were treated in the Pasteur hospital in common wards. I found quite the reverse. This hospital consists of two two-story pavilions. Each floor is referred to as a ward. Each ward has a central aisle, on either side of which are cubicles in pairs. Each cubicle is designed for a single patient. It has a plastered wall on two sides and a glass partition extending from the ceiling almost to the floor on the other two sides. Each is separated from the central aisle by one of these glass partitions and from its mate by the other glass partition. The patients while isolated do not feel imprisoned for they can see people passing in the aisle and if they are well enough can see the patients in the adjoining cubicle. The reason for building these cubicles in pairs with a brick partition between was that such partition was considered necessary to carry ventilating pipes, etc. Each cubicle has a door opening upon the central aisle and also a door opening upon an outside veranda. A single nurse (or sister) may take care of a number of patients suffering from different diseases. The care of infectious diseases on the cubicle system is based on the idea that such diseases are carried rather by the nurses than by the air. The nurse is the chief point of danger and must therefore be above question as to her methods. In dealing with ordinary cases the nurse enters the cubicle at this Pasteur hospital from the inner aisle but in dealing with certain cases where the danger of infection is greater the entrance to the aisle is closed and the nurse reaches the cubicle through the outside door. In dealing with specially severe cases a special nurse is assigned to the case and she has nothing to do with the interior of the ward, reaching her patient through the outside door. Of course under such conditions the patient is as thoroughly isolated as though he, or she, were in a separate building.

A group of beds is not set aside for any particular disease. When a patient has recovered, he, or she, has a disinfecting bath, is given fresh clothing and is discharged; and the cubicle occupied is at once thoroughly disinfected. It is then ready for the next patient entering, regardless of the disease from which the last patient suffered or the incoming patient is suffering. The nurse is not **staying** in the cubicle with any patient. She simply goes in from time to time as she is needed. The nurse's dress is very much like that of a surgeon ready for an operation. Her hair and head are enveloped in a bandage. She wears white throughout. Only her face and hands are exposed and her hands are washed each time as she goes from a patient. At the time of my visit I saw one case of sleeping sickness (a priest from Africa), one case of cerebro-spinal meningitis, one case of diphtheria, one case of measles and two or three cases of scarlet fever; all on one floor under the care of one nurse during the day.

This system of cubicles should greatly simplify the construction of small isolation hospitals, for it does away with the building of wards for each disease. The question is naturally raised as to whether there is any cross infection in such a ward. The record of infections occurring in this hospital is as follows for ten years (taken from the published report, 1910):

Diphtheria: 2 physicians, 3 nurses.

Scarlet Fever: 2 physicians, 1 nurse, 3 domestics.

Erysipelas: 3 sisters.

Typhoid Fever: 2 sisters.

LONDON: EASTERN HOSPITALS: On September the 15th I visited the above institution. Dr. E. W. Goodall, the medical superintendent, made many very valuable suggestions. In general construction this institution is much like the one at Edinburgh, although it is much older and much more contracted, for it is located in a thickly settled part of the city. The chief features are:

(a)—The new ward with "isolation chambers,"

(b)—The discharge ward.

(a)—**Isolation Chambers:** An old ward has been taken in one of the pavilions and divided up into "isolation chambers" or cubicles. These are arranged on either side of a central passage, ten on each side. The partitions from about three feet above the floor to the ceiling are of glass entirely, thus differing from the Pasteur hospital at Paris. The lower part of the partition is of some composition. The framing is of iron. Inside of each door hung two gowns; one for the doctor and one for the nurse. Each of these persons on entering a chamber puts on the garment assigned for his, or her, use. In the corner of each chamber is a stationary wash-bowl with a goose-neck spray over it. The water for the spray is turned on by foot action. The doctor or nurse washes the hands after handling the patient before leaving the chamber, using an antiseptic. Each chamber is applied with is own heat radiator and separate ventilator. The arrangement of the radiator is rather ingenious, for, although it stands in its normal position against the wall under the window, it can be swung out at right angles.

There is thus no place for the collection of dirt, etc., behind the radiator. Under the window, opening into each chamber is a fresh-air duct, which can be shut off entirely or opened up to quite an extent. When open the fresh air passes through the steam radiator before entering the room.

This ward is comparatively new and therefore has no statistics. It is used largely for children and the care of mixed infections or cases with a doubtful diagnosis, the intent being to limit the spread of other diseases in wards assigned to special diseases. Dr. Goodall made the point that patients isolated in these chambers are not so lonely as those isolated in rooms. He felt that adults would often prefer isolation in a room to isolation in one of these chambers and to meet this condition he was bringing into use certain rooms in one of the pavilions for adult patients. Each of these rooms is entered by a door from the outside, is furnished with one window and is heated with a fireplace. Dr. Goodall was of the impression that a ward fitted with isolation chambers would do much in protecting those admitted with uncertain diagnosis and also in preventing the cross infections in wards, but he considered it too expensive for use on a large scale, as in the care of infectious diseases in London. He stated that large numbers demand wards unless the money for construction and care of the patients is unlimited.

This new ward with isolation chambers is the only feature of special interest at this hospital, the rest of the building being old, but apparently well arranged and well kept.

Each isolation chamber has a little over 2,000 cubic feet of air space. It measures 12x12 feet with a 14-foot ceiling.

Dr. Goodall thinks the ideal ward with isolation chambers should have no central hall but outside passages on either side, with the doors opening from the chambers on to them. This would mean that the nurse could not pass from chamber to chamber without going through the outside air. It would further diminish danger of her carrying infection from one patient to another.

(b)—**The Discharge Ward:** Dr. Goodall thinks that the plan of taking patients from wards, giving baths and changes of clothing and sending them out at once is bad. He thinks that catarrhal trouble is apt to start up during certain seasons at least and thus account for "return" cases. He has therefore asked for a discharge ward and this he hopes to have in the near future. With the discharge ward, when the patient is ready to be discharged, he, or she, will be taken from the general ward, given a disinfecting bath and fresh clothing and then transferred to the discharge ward for two days. When this time has elapsed the patient is ready to go out without danger

Four weeks is the quarantine period for scarlet fever. Patients may be discharged peeling on hands and feet but not with nasal, faucal, aural or other discharges.

Diphtheria patients are discharged on two negatives.

LONDON—SOUTHWESTERN HOSPITAL: This hospital I visited September the 16th with a letter of introduction from Dr. Caiger, the superintendent, to his first assistant, Dr. d'Amico. The purpose of my visit was to note the system of cubicles used here in two wards. These have been constructed in two wards located in a two-story pavilion. The cubicles in the lower wards are fitted up with beds for women and children; those in the upper wards with cots for children only. Four of the cubicles in the lower ward are used as a "discharge ward" for scarlet fever patients.

These two wards, opened about three years ago, have cared for over 1,000 patients. They are intended for scarlet fever, diphtheria, typhoid, erysipelas, etc., everything, in fact, but measles, chicken pox, German measles, whooping cough and smallpox. Dr. d'Amico stated that to date there had not been more than six "cross infections" for scarlet fever and diphtheria and not more than fifteen "cross infections" for scarlet fever and diphtheria and not more than fifteen "cross infections," including measles and chicken pox. Patients suffering from these two last diseases get into these wards only by mistake or accident. Scarlet fever patients are discharged from this hospital while some parts are still peeling, the discharges being rather the indication for release. Diphtheria patients are released four weeks after the throat is clear without culture, if there is no nasal discharge. Some of the patients of both diseases are sent out to the Convalescent Home if the disease is prolonged. Dr. d'Amico believes that severe cases of either scarlet fever or diphtheria in a general way may intensify the infection of other cases suffering from the same disease in the ward and thus cause discharges from the ear and nose of previously simple cases of scarlet fever. This opinion while held by many English physicians is not universal.

In these cubicles the partitions extend only eight feet from the floor (the ceilings being 14 feet). The partitions are of iron frames with wooden panels from the floor for about two feet and glass for the other six feet, single panes of glass being used for the full length (each pane about 18 inches wide). Double-swing doors about two feet high lead into the cubicle. The attendants can therefore enter a cubicle without touching the door with the hands. The doors, however, have catches on the outside which are turned when no one but the patient is in the cubicle.

Each cubicle is supplied with a wash basin with goose-neck over it. The same is furnished with luke-warm water and is operated by foot action. In each is a little cupboard by the bed or cot, in which is kept for the patient brush and comb, spray outfit, etc., also a blanket. When the patient needs bathing, he, or she, is wrapped up in the blanket and carried to the common bathroom. After the bath the patient is again wrapped in the blanket and carried back to the cubicle and the bathtub is disinfected.

When the patient is discharged the cubicle and its contents, bedstead, etc., are washed with a carbolic acid solution. The bedding, special blanket, etc., are taken out and disinfected. The cubicle is then ready for the next patient. Dr. d'Amico stated that they had never had the following patient infected by the preceding patient, and this regardless of the disease.

Gowns hang in each cubicle for both doctor and nurse.

LONDON—CONVALESCENT HOSPITALS FOR INFECTIOUS DISEASES: There are two (or more) convalescent hospitals for infectious diseases in London. Prolonged cases are sent from the fever hospitals to these convalescent hospitals, and it is stated that this change shortens the detention period in some.

Dr. Goodall is of the opinion that convalescence and the disappearance of the infectious agents are more rapid in the convalescent hospitals than in the fever hospitals proper. The former are removed from the crowded portions of the city, and of course there is opportunity for the patients to be in the open air.

WALTHAMSTOW FEVER HOSPITAL, NEAR LONDON:. At the invitation of Dr. J. J. Clark, medical officer of health, I visited the above institution. The district has a population of about 140,000 and the fever hospital has about 100 beds. It was built under a permit from the local government board, which board expects fever hospitals to contain one bed for each 1,000 of the population. The fever hospital does not quite come up to this standard, but it is large enough. In fact, it is under contract to furnish a certain number of beds to a neighboring district, for which it receives a "retainer," and in case there is a bed or beds occupied, a fixed weekly sum in addition. Dr. Clark stated that the number of cases of scarlet fever and diphtheria per annum had been falling off, and this may be attributed, he thought, to medical school inspection, which limits infection in the schools and thus reduces the total number of cases. Dr. Clark is "school doctor" as well as medical officer of health. He has a woman physician as his assistant in the school work.

The hospital is beautifully situated and the grounds are well cared for. They comprise five acres, but the entire property covers twenty acres. Thus, the hospital is capable of expansion.

My visit to this hospital was especially to see and get data regarding the isolation chambers. These are located in what is known as the "Cubicle 'G' Block." In this block there are twelve cubicles, 12x12x12 feet, enclosed in plate **glass** except for the lower two feet of each partition and the outer wall. The lower two feet of the separation walls between the chambers and the frames to support the glass are of wood. It was stated to me that the plate glass partitions are cheaper than the ordinary partitions. The panes are full length, 10 feet, and 2 feet or more wide. The heating is with hot water. The hot water pipes pass through some of the between-cubicle partitions in order to make the connections, but Dr. Clark stated that the packing around these pipes is so complete that there is no leakage of air or formaldehyde gas during the process of disinfection.

In this block six cubicles are in either end, with a "duty" room and storing closets between them. As the partitions between these cubicles or chambers are of glass, the nurse from the duty room can see every patient. The block is lighted with electricity and a hanging electric light is located in each chamber. The nurse can turn on this electric light from the door or from the duty room. At night, therefore, she can quietly turn on the light in any chamber to note whether the patient is sleeping or resting comfortably without lighting up the entire block. These cubicles differ from those of the Eastern and Southwestern hospitals, London, in that entrance is made to each from an outside passageway only. The nurse, therefore, has to pass into the open air each time in going from one patient to another. Facilities are provided on the passageway for the washing of hands before passing from one patient to another. A gown hangs outside of each cubicle for the use of the nurse before entering. The entrance pipes for the special ventilation of each cubicle are carried from the outside under the floors from the **farther** side of the building, so that the cubicles that are on the lee side of the building receive their underground air from the windward side. In addition, each cubicle has an opening for fresh air through the outside wall; an opening in the ceiling for the exit of air and also ventilators at the top of each outside window. The floors throughout this block are of "terratzo." The outside passage has a brick floor and glass roof resting on an iron frame. At either end of the building, but outside and separated from it by a narrow covered passage, are toilet closets and baths.

The hot water radiator in each cubicle stands in the room and not against the wall. The building is of brick and one story high. The cost per bed is about $1,000.

Each cubicle has a little box to hold the instruments, medicines and the special blanket in which the patient is carried to the bath.

If privacy is needed for any patient, this is secured by the putting up of screens around the bed.

All diseases but smallpox and tuberculosis are admitted into this block, and there have been no cross infections.

In the report for the year 1909 the statement is made that during the past year 132 patients—i. e., 25 per cent of the cases admitted—were treated wholly or in part in this block of twelve beds. The report states further:

> "It is unfortunately not possible to give statistics relating to the results of treatment in the cubicles as compared with the general wards, or to give any idea of the possible effect of separate isolation on the number of return cases. There is, as a rule, such a demand on the accommodation of this block that septic and doubtful cases have to be moved to the convalescent wards as soon as possible, so that only a part of their time is spent in the cubicles and they are therefore useless for purposes of comparison.
>
> "In spite of the varied nature of the cases and the high infectivity of some of the diseases treated, such as chickenpox and mumps, no case of infection has been carried from one cubicle to another.
>
> "Of the 132 cases treated in the cubicles, 18 showed indefinite signs of any infectious disease during their stay in the hospital, 20 were cases of scarlet fever which had no definite signs or symptoms on admission but later showed typical desquamation, 9 were cases of scarelt fever and diphtheria, 26 were removed to 'G' after admission on account of suspicious symptoms—the majority of these were patients admitted as diphtheria who proved to have no diphtheria bacilli present and whose other symptoms suggested that they might have had a slight attack of scarlet fever—12 were cases of acute nephritis complicating scarlet fever. These are found to make very satisfactory progress in the cubicles owing probably to the warm, equable temperature it is possible to maintain there."

MANCHESTER FEVER HOSPITAL—"Monsall Hospital": I visited this institution in order to study what is known as the "barrier" method (tapes) of separating patients from one another. The hospital is under the superintendence of Dr. Fletcher, formerly of Bristol. I found that the so-called barrier method is used to limit the spread of disease in dealing with mixed infection or with doubtful cases. Such patients, if in a ward with other patients, are placed as far distant as possible from other beds. The nurses when caring for these selected patients put on a special gown and rubber gloves before handling them. After finishing with the patients, the rubber gloves are taken off and placed in an antiseptic solution, after which the hands are washed in an antiseptic solution.

Dr. Fletcher also uses what he called the "turfing-out" method in dealing with certain diseases which may have been accidentally introduced into a ward. For example, if a scarlet fever patient were admitted with the patient in the incubation period of chicken-pox, when this latter disease appeared in the patient the disease would in all probability become epidemic throughout the ward if proper precautions were not taken at once. The precautions required by Dr. Fletcher are that the scarlet fever patients suffering also with chicken-pox shall be removed at once from the ward, and that the patients on either side of such doubly-infected patient shall be removed from the ward two or three days before the incubation period of chicken-pox has elapsed. In all probability these removed patients will develop chicken-pox, but the disease so far under Dr. Fletcher's observation has not extended to other patients in the ward. This taking out of patients on either side of the initial case is what Dr. Fletcher calls "turfing-out." It would thus seem that the infection of chicken-pox does not carry far. Dr. Fletcher believes that the infection of measles and whooping cough may carry farther than that of chicken-pox, but this is due to the fact of spread by the explosive coughing of patients suffering from this disease. The control of whooping cough and measles through a chance case admitted into a ward is therefore not so easy as is that of chicken-pox. Dr. Fletcher is of the opinion that a severe case of scarlet fever with infective discharges will intensify the disease among the milder patients in the wards.

It will be seen from the above statement that the intent of the barrier or tape method is not to separate patients suffering from different diseases in the same ward, but rather to separate temporarily to a certain extent patients suffering from mixed infection or patients having a severe type of the disease from others in the ward.

SUMMARY.

It was not my purpose to visit and investigate many fever hospitals, but rather to get ideas. I have described:

(1) The old original idea of wards for each disease, as illustrated at Edinburgh;

(2) The principle of individual isolation for all diseases in a common hospital, as illustrated at the Pasteur Hospital for Infectious Diseases;

(3) The limited use of isolation chambers or cubicles, as illustrated at the Eastern and Southwestern hospitals, London;

(4) The more general use of the isolation chamber or cubicle, as illustrated at Walthamstow;

(5) The partial isolation of certain cases in wards by means of the barrier system, together with the turfing-out system, as illustrated at Monsall hospital, Manchester.

It would seem as though Minnesota could learn something from these institutions. Up to the present our hospitals have been constructed on the old plan; i. e., a ward for each disease. An isolation hospital in a district with a small population could certainly be constructed and maintained on the cubicle or isolation method cheaper than with the ward plan for each disease. It would seem to me that a two-story building might be constructed somewhat on the plan of "Cubicle 'G' Block" at Walthamstow, the first floor being used for the keeper, the heating plant and administrative offices, and the second floor for the care of the patients. It is possible that in our cold climate the outside passages, with entrance only from the outside to the cubicles, as at Walthamstow, might be undesirable, and that it would be necessary to have an inside central passage. Without question, the success of the cubicle method depends largely upon the loyalty and conscientiousness of the nurses and of the physicians. Loyalty on the part of the nurse was considered fully to be depended upon by all those who had had experience with the cubicle method.

One thing, however, must be stated in connection with this. The nurses for fever hospitals, in England especially, are trained to their duties; in fact, with the larger fever hospitals there are training schools in each one for nurses. While my investigation was somewhat limited, there was only one place which I visited where nurses were taken from a general hospital to a fever hospital and were allowed to return to the general hospital immediately after the patients had recovered. There was, in consequence, none of the danger of spreading infectious disease from fever hospitals to general hospitals, which exists in this country to quite an extent.

TUBERCULOSIS.

Tuberculosis is receiving a great deal of attention in the state at the present time, not because of its special character, but because of the fact that it has been and still is causing more than one-tenth of all the deaths in the state, and more than all the deaths resulting from the other communicable diseases.

In the eyes of the law, tuberculosis is grouped with the communicable diseases, and therefore is to be looked after by local boards of health, the same as typhoid fever, scarlet fever, diphtheria, etc. In fact, tuberculosis is comparable with diphtheria so far as the nature of the infection is concerned, the point of difference being that the one (tuberculosis) is chronic in type, while the other (diphtheria) is acute. In both the infectious material leaves the body in the majority of cases in the discharges from the respiratory tract.

The death record for tuberculosis in Minnesota from 1890 to the present time is as follows:

Year.	Population.	Deaths.	Rate per Million.
1890	1,301,826	1,471	1,129
1891	1,356,385	1,466	1,080
1892	1,410,944	1,468	1,040
1893	1,465,503	1,541	1,051
1894	1,520,062	1,644	1,081
1895	1,574,619	1,693	1,075
1896	1,609,974	1,661	1,031
1897	1,645,349	1,619	907
1898	1,680,704	1,704	1,013
1899	1,716,059	1,703	990
1900	1,751,395	1,864	1,064

1901	1,786,731	1,756	983
1902	1,822,067	1,759	964
1903	1,848,688	1,932	1,045
1904	1,881,119	2,143	1,139
1905	1,913,550	2,009	1,050
1906	1,945,981	2,042	1,049
1907	1,978,412	2,039	1,030
1908	2,010,843	2,161	1,075
1909	2,043,274	2,306	1,129

Some of the variations in death rate are explained by the imperfect records of deaths in the past furnished the Minnesota State Board of Health by local officials.

This disease is dependent upon a specific bacillus first reported upon by Dr. Koch in 1882. The tubercle bacillus is short-lived when exposed to sunlight. The danger of infection from a tuberculous patient is slight indeed as compared with that from those suffering from any other communicable disease. In fact, such danger may be reduced to a minimum by exercising the simplest acts of cleanliness. There has been an unreasonable alarm concerning the many possible channels of infection from this disease. So far as tuberculous patients themselves are concerned, the danger of their infecting others is not great unless they are suffering from the pulmonary form of the disease in the advanced stages, when in the act of coughing the bacilli are given off constantly in the expectorate. The danger of infection from the milk of tuberculous cows has been greatly exaggerated. Many children die yearly as the result of using dirty milk; very few, indeed, die as the result of infection through the use of milk from a tuberculous cow. This statement is not made with the intent of discouraging the careful inspection of dairies in order to detect the presence of bovine tuberculosis, but rather to discourage the tendency now so common in some localities of trying to eliminate the spread of tuberculosis among human beings by the occasional testing of dairy cattle with tuberculin. The great danger of infection from this disease is through close association with tuberculous individuals. It has been wisely stated that this bacillus is in every sense a house plant and the disease a house disease. Close association with an expectorating consumptive is dangerous, and sleeping with, or even in the same room with, such a patient should be absolutely prohibited. The deaths due to consumption following one another closely in a family are the result of infection through unjustifiably close association of the healthy with the diseased, not through heredity.

In dealing with tuberculosis we have four groups of individuals presenting themselves for consideration:

(1) The non-tuberculous;
(2) The incipient (early) cases;
(3) The advanced cases;

(4) The hopeless cases.

The first group has a right to demand protection. To bring this about there must be:

(1) Supervision of the diseases, and this consists of—
  (a) The registration of all cases;
  (b) The inspection of homes and surroundings of tuberculous patients;

- (c) The care of the tuberculous poor;
- (d) The cleansing of the homes of the tuberculous;
- (e) Regulations to prevent extension of the disease;
- (f) A thorough enforcement of the regulations.

(2) Education of the people, and this consists of—
- (a) The teaching of infection rather than heredity;
- (b) The care of the sputum of tuberculous patients;
- (c) Important treatment for the tuberculous, consisting of an abundance of fresh air, sunlight, good food and rest;
- (d) The fact that drugs have a very unimportant bearing in the treatment of this disease;
- (e) The importance of the early recognition of the disease. This is emphasized by the fact that conservatively stated at least 66 per cent of those in whom the disease is recognized early may recover; while not more than 28 per cent of the advanced cases and not more than 2½ per cent of the far advanced cases ever recover.

(3) Proper care of the tuberculous, and this requires—
- (a) Sanatorium treatment for early cases, primarily for its educational effect on patients and the friends of patients, and also for its curative effect;
- (b) Hospitals for the advanced cases, primarily for the control of infection and also for the educational effect upon patients and the friends of patients and for the curative effect to the greatest extent possible.
- (c) Rest houses for the incurable, the purpose here being primarily to prevent infection, but also to place the unfortunate poor under the best conditions possible during the last stages of the disease.

Besides the three types of institutions named above, the home treatment of the consumptives must also be considered, for it will be years before any large percentage of the tuberculous in this state can be cared for in institutions. With total deaths of over 2,000 per annum from this disease in Minnesota, there must be at least 10,000 cases as constant residents in the state, and a considerable proportion of this number must be taken care of in the home. To do this properly, trained nurses in every community are most necessary. These trained nurses should act under some local organization, having the general interests of the tuberculous in mind.

It may be well to explain what has been done during the past few years in bringing about organizations to aid state health authorities in the control of this disease. In January, 1904, under the auspices of the tuberculosis commission of Maryland, the board of health of that state and the Maryland Public Health Association, the first tuberculosis exhibition was held in the United States in Baltimore. This exposition was in every way a success. During this exposition an informal meeting was held to consider the formation of a national association to deal with tuberculosis problems in the United States. As a result, the National Association for the Study and Prevention of Tuberculosis was organized. This association held its first meeting at Washington in May, 1905. Annual meetings have been held since that time. The headquarters of the association are in New York City. Great good has been done through this organization, both directly by distribution of literature and indirectly by encouraging the organization of state associations.

In connection with this association as an educational feature is a traveling exhibit, which has been sent to the larger cities throughout the country.

In October, 1908, the International Congress on Tuberculosis met at Washington under the auspices of the National Association for the Study and Prevention of Tuberculosis. This international congress had a widespread influence, as it brought to the attention of the people the importance of dealing with this disease in a proper manner.

Following in line with the national association, the Minnesota Association for the Prevention and Relief of Tuberculosis was organized in 1906, and its work, which was carried on at first in connection with the Minnesota State Board of Health and under its direction, has during the past year and a half been carried on independently under the supervision of Mr. Christopher Easton, as executive secretary.

In discussing the work of the state relative to tuberculosis, the establishment of a hospital for crippled and deformed children must not be overlooked, as a large percentage of these children owe their deformities to tuberculosis of the bone. In 1905 a commission was created to investigate the advisability of a state hospital for the treatment, care and education of crippled and deformed children. In 1907, St. Paul tendered to the state land and a building adjoining the city hospital for the purpose of carrying on the provisions of this commission. In addition to this, certain St. Paul citizens tendered to the state a gift of twenty-three acres adjoining Phalen Park and $5,000 towards the construction of cottages on the park site. This institution will be opened about Jan. 1, 1912, and in addition to the treatment of deformities will conduct a school, so that the children will not only receive medical aid, but will also be educated, so as to grow up into useful men and women.

In trying to promote the proper care of tuberculosis, the State Board of Health has been carrying on an educational campaign during the past three years, and using for this purpose in part a traveling exhibit. This exhibit has visited most of the cities and villages of the state having a population of 1,000 and upwards, and some of the municipalities having a smaller population. In connection with the exhibit in each place have been courses of lectures bearing upon this and other communicable diseases. This work was originally started without any special appropriation, the money for its support being taken out of the funds ($5,000) appropriated for dealing with communicable diseases. A special appropriation of $25,000 per annum was asked of the last legislature, but in response to this request only $9,000 was granted for the entire work of dealing with communicable diseases throughout the state. It has not been possible to use more than $4,000 per annum of this amount in the anti-tuberculosis campaign.

Preceding the creation of the State Association for the Prevention and Relief of Tuberculosis was that of the Minneapolis anti-tuberculosis committee, which was largely due to the activity of Mr. and Mrs. George H. Christian. In the spring of 1903, Mrs. Christian asked of a state official if something could not be done for the tuberculous poor in Minneapolis. The answer was in the affirmative, explaining the various lines that might be followed. Mrs. Christian expressed a wish that something be done. A conference of physicians was called in November of that year. As an outgrowth of this conference, a proposition was presented by the Associated Charities of the city to the effect that a committee be formed somewhat similar to the one existing in New York City, consisting of lay and medical men, to carry on the campaign against tuberculosis. A committee was formed, consisting of thirteen physicians and twelve laymen. This committee raised its own funds for carrying on the work and employed at first a visiting nurse to hunt up tuberculosis cases that needed care. These nurses visited the patients in their homes, told them how to care for the sputum in order to prevent the infection of others, how to live in the fresh air as much as possible, and how to ventilate and care for the sleeping rooms. They also noted whether or not the patients were in position to obtain the necessary food. If they were too poor to do so, then a means of providing the necessities was found. This work of the visiting nurses was later turned over to the special group of visiting nurses connected with the Associated Charities, thus making it possible to greatly extend the work. The funds for the support of the visiting nurses from the Associated Charities have during the past few years been secured largely through what is known as tag day, at which time thousands of dollars have been obtained.

In 1908 the St. Paul anti-tuberculosis committee for the control of tuberculosis was organized, and Mr. Barney Rosing was secured to superintend this work. The funds for carrying on the work of this committee in St. Paul have also been secured largely through tag day, and it should be stated that all of the funds secured by tag day in St. Paul are devoted to the anti-tuberculosis campaign, while only part of the funds thus secured in Minneapolis are set aside for this special work, the rest being used in the employment of visiting nurses for other purposes than the care of tuberculosis.

A similar local organization exists in Duluth, and it, too, secures part of its funds through tag day. Duluth, too, has its visiting nurses. Similar institutions have been established in many of the cities and villages of Minnesota, and visiting nurses are doing service in many of these places.

So much for the attempt to care for the tuberculous in their homes.

The state created a tuberculosis commission in 1901 and provided it with funds to purchase a site for a sanatorium. This site consists of 740 acres near Walker. The sanatorium was opened for the admission of patients in December, 1907. This institution has accommodation for 90 patients. It is meant especially for the care of the early cases. Provision is made in the law for the sending of patients to this institution by the county commissioners throughout the state, the counties paying the expense for such patients where necessary. About 30 per cent of the 500 cases admitted to date have been supported by the various counties.

The legislature of 1909 by act (chapter 347) provided for the creation of county sanatorium commissions with power to provide county sanatoria for the treatment of tuberculosis. Up to the present time the law has been taken advantage of by two counties only, viz., St. Louis and Wabasha.

In addition to the county sanatorium now being planned for in St. Louis county, there is a special ward located on the poor farm near Duluth for the benefit of the consumptive poor in that county.

Mr. and Mrs. George H. Christian, having maintained a summer camp for consumptives in Minneapolis during two years, made a gift of a special building, the Thomas hospital, for the care of advanced cases. This is under the control of the Lutheran church. It has about fifty beds, and up to the present time has cared for about four hundred patients.

The incentive thus given to anti-tuberculosis work in Minneapolis was followed by the erection of Hopewell hospital, which was originally intended for the early cases, and had in its first pavilion accommodation for twenty patients. This hospital is to be enlarged, and will in the near future have fifty beds for the care of the tuberculous.

Twenty-four beds have also been provided at the Contagious Disease hospital in Minneapolis for the care of the tuberculous. That city, therefore, has at present some over one hundred beds for the care of patients suffering from this disease. It must be understood, however, that Thomas hospital is not for Minneapolis patients only. It is open to patients from all parts of the state.

Certain provision has been made for the care of consumptives in the city hospital of St. Paul, and under the anti-tuberculosis organization a sanatorium was opened in 1909, which has accommodation for 22 patients

In both Minneapolis and St. Paul day camps have been maintained during the summers for tuberculous children.

The present legislature should pass laws bearing upon this disease as follows:

(a) Compulsory reporting of all tuberculous cases;

(b) State aid for county sanatoria;

(c) Provision for bond issue to pay for county sanatoria;

(d) A requirement that school children from a home where tuberculosis exists shall have a clean bill of health before being permitted to attend school;

(e) The segregation of the tuberculous poor in almshouses.

In conclusion, the important points in the control of tuberculosis are:

First—An early diagnosis of the disease. In this the responsibility is about equally divided between the patients, the patients' friends and the physician.

Second—The education of the people in order that they may know that tuberculosis is both a preventable and a curable disease.

Third—A recognition of the fact that the general practitioner and sanitary authorities must work together in the care of those cases which become centers of infection, viz., cases with the tubercle bacillus present in the sputum.

Fourth—The necessity for the proper care of tuberculous patients, either at their homes, in sanatoria or in hospitals, in order to prevent the infection of others.

Fifth—The necessity of considering the protection of the uninfected as an important factor in the control of tuberculosis.

Sixth—The even greater necessity of caring for advanced or incurable cases if the disease is to be brought under control.

Seventh—The creation of conditions to meet all requirements in the care of tuberculosis, embracing sanatoria, hospitals, dispensaries, visiting nurses, etc.

Eighth—A recognition of the fact that medication is but a small factor in the control of tuberculosis, while good hygienic surroundings for the patient, together with prophylactic measures to protect the uninfected, are of the greatest importance in the control of the disease.

It is only the pulmonary form of tuberculosis (consumption) that stands out as a great economic problem. The community is comparatively free from danger so far as relates to the other forms of tuberculosis, tuberculosis of the glands, of bones, of special organs, etc. Those relate more especially to the individual infected and demand special treatment. Minnesota is fortunate in having such an institution as the state hospital for crippled and deformed children, where a child suffering from certain forms of tuberculosis can be housed and cared for in the best manner possible, in order to arrest the disease, correct the deformity and educate the child.

The parent nativity of those who died of tuberculosis in Minnesota during 1909 was as follows:

Norway	488
Sweden	390
Denmark	39
Finland	78
Germany	294
Great Britain	44
Ireland	134
Canada	72
Other foreign countries	145
Minnesota	105
Other states	[illegible]

The loss from tuberculosis in Minnesota during 1909, based on the method used by Prof. Irving Fisher, is as follows:

Loss of earnings due to disability, 2,304 persons at $1,575	$3,628,800.00
Cost of medical attendance, nursing, etc., 2,304 persons at $1.50 per day for 1½ years	1,843,200.00
Loss in future earnings, 2,304 deaths, valued at $2,400 each	7,372,800.00
Total loss to Minnesota, 1909	$12,844,800.00

A closer computation through the wage-earner would show this loss to be even larger than this. The loss to Minnesota during 1907 and 1908, based only on the loss through the wage-earner was $23,305,038 (Easton).

Special Tuberculosis Work: In August, 1907, the secretary of the Board was instructed to secure Mr. Christopher Easton, he to be in the employ of the Board Oct. 1, 1907, and to assist in working up the vital statistics report until Jan. 1, 1908. From this date on he was "to take up the work of conducting a campaign against tuberculosis for the State Board of Health and the State Association for the Study and Prevention of Tuberculosis jointly."

Mr. Easton accepted the proposition and entered upon his work October 1. Plans were made for equipping a traveling tuberculosis exhibition, to be used as a part of the educational movement against this disease. This exhibition was first sent to Stillwater early in 1908. Then it went to Mankato, Owatonna, Rochester, Winona, Wabasha, Lake City and Red Wing. After this trip it was sent to Washington as a part of the exhibit at the International Congress on Tuberculosis. On returning from Washington Mr. Easton made another trip with the exhibit, going to Duluth, Cloquet, Hibbing, Eveleth, Virginia, Ely and Two Harbors.

The legislature of 1909 was asked for an appropriation of $25,000 per annum to carry on the educational work against tuberculosis, but it granted practically nothing. It did, however, increase the communicable disease fund from $2,500 to $9,000 per annum, and part of this fund was used to continue the anti-tuberculosis campaign.

Mr. R. Blakey, who had made a special study of sociology as a university student, and who graduated in June, 1909, was secured June 1 to assist Mr. Easton.

Mr. Easton resigned from the Board's work, to take effect July 31, 1909.

Dr. C. C. Pratt was engaged to succeed Mr. Easton, Aug. 1, 1908, and he and Mr. Blakey carried on the anti-tuberculosis campaign, traveling with the exhibit through the winter of 1908 and 1909, and visiting:

Warren
Thief River Falls
East Grand Forks
Crookston
Fosston
Bemidji
Ada
Moorhead
Park Rapids
Detroit
Perham
Wadena
Aitkin
Wahpeton, N. D.
Breckenridge
Fergus Falls
Staples
Brainerd
Wheaton
Graceville
Morris
Alexandria
Long Prairie
Sauk Center
Melrose
St. Cloud
Ortonville
Appleton
Benson
New London
Willmar
Atwater
Litchfield
Dassel
Howard Lake
Waverly
Elk River
Delano
Anoka
Dawson
Montevideo
Granite Falls
Renville
Olivia
Hutchinson
Glencoe
Farmington
Redwood Falls
Winthrop
New Ulm
Sleepy Eye
Springfield
Northfield
Faribault
Sleepy Eye
Pipestone
Slayton
Windom
Madelia
St. James
Lake Crystal
Blooming Prairie
Luverne
Adrian
Worthington
Heron Lake
Jackson
Welcome
Fairmont
Blue Earth
Winnebago
Albert Lea
Austin

The places visited by the anti-tuberculosis exhibition are shown on the following map.

The tuberculosis death statistics for Minnesota during 1909 are as follows:*

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*Figures for cities over 5,000 population are printed in heavy faced type, but the same figures are included in the county line preceding. Under the heading "Occupation," "None" includes "Not given."

DIPHTHERIA.

This disease is in a way comparable with tuberculosis, for it is dependent upon a specific germ, and this germ escapes the body in discharges from the respiratory tract. If, therefore, these discharges were carefully collected and destroyed, as we now direct the collection and destruction of the tuberculosis sputum, the disease might be greatly reduced. But diphtheria differs from tuberculosis in certain ways. It is intensely sudden in its onset, and often the patient is dangerously ill, or even dead, before the nature of the disease is known. It is for this reason that we still have such a high death rate. Antitoxin has reduced the mortality in Minnesota from 40 per cent to 10 per cent, but this still fatal 10 per cent exists because of the fact that in these cases the antitoxin is either not used at all or not used early enough. The high cost of antitoxin in the past too often prevented its early use, even in recognized cases of diphtheria. In November, 1906, an arrangement was entered into with the Lederle laboratories of New York City to distribute antitoxin through the Minnesota State Board of Health at a greatly reduced rate in the treatment of the poor, as shown by the following circular:

ANTITOXIN FURNISHED BY THE STATE BOARD OF HEALTH.

The laws of Minnesota provide that every local board of health shall see that those sick with a communicable disease (and this includes diphtheria) are provided with all necessary medical assistance, medicine, etc. The parties cared for are required to pay for such if able; otherwise the municipality (village or township) pays the necessary bills, recovering half of the amount expended from the county later.

Antitoxin is the most important therapeutic agent in the treatment of diphtheria; in fact, it should be used in every case of diphtheria.

Too often in the past, the people, officials, and in some instances I am sorry to say physicians, have neglected to use antitoxin because of its cost. This position under any circumstances is untenable, for human life is not to be measured in dollars and cents, but one or more doses of antitoxin, even at the highest market price, is as nothing compared with the old medicinal treatment of diphtheria.

The cost of antitoxin can no longer be an argument against its use in Minnesota. The law specifically requires that diphtheria cases be properly treated, and this is not possible without antitoxin. Local authorities must furnish antitoxin free if the people are too poor to pay for it, and this refers to the prophylactic, as well as the curative use of this agent.

PLAN FOR SUPPLYING AND DISTRIBUTING ANTITOXIN.

In order that boards of health may be able to secure reliable antitoxin on short notice, the State Board of Health has arranged to keep a fresh stock constantly on hand, and a supply will be sent at once to any board of health requesting it.

Arrangements have been made with the Lederle Antitoxin Laboratories of New York City, to keep the Board supplied with their concentrated antitoxin, which is the antitoxin now being used in New York City and many other places. A specially low price has been made to boards of health. This antitoxin comes in single packages, put up in glass syringes ready for use, and will be kept in doses of 1,000 and 3,000 units. The price, including the syringe, to boards of health, is:

1,000 units, with syringe..........................	$0.60
3,000 units, with syringe..........................	1,40

DOSAGE.

Immunizing Dose—1,000 units.

Curative Dose—In light cases, not involving the larynx, if treatment is given on first day of disease, 3,000 units will generally be found sufficient. If the disease is severe, and in all cases of diphtheritic laryngitis, at least 4,000 units should be administered, While 5,000 to 10,000 units are often indicated. If favorable results do not follow within eight hours, the initial dose should be repeated or doubled. With refined and concentrated antitoxin, giving a maximum of strength in a minimum bulk, it is safer to give large doses than to risk the danger of an insufficient dosage.

The arrangements for the distribution of antitoxin by the State Board of Health are as follows: Upon the request of any local board of health, or of its health officer, made to the secretary of the State Board of Health, he will at once send by mail or express, prepaid, the number of packages ordered, in the doses indicated. A statement will be sent to the person who orders the antitoxin, and a duplicate statement will also be sent to the producer. The latter will collect the amount due for the antitoxin from the local board of health. The State Board of Health will not receive any money, and is simply acting as a distributing agent for the purpose of saving time.

It may happen that an outbreak of diphtheria will occur where many persons have been slightly exposed, as in school, for example. The local board of health may wish to have a small supply of antitoxin on hand for such an emergency, but may not be called upon to make use of it. To meet such conditions a board of health may order as many as twenty immunizing doses and ten curative doses, and have the privilege of returning to the State Board of Health within thirty days any unopened packages, for which they will receive credit. The only extra expense, where this is done, will be the postage or expressage upon the packages returned.

In ordering antitoxin care should be taken to explicitly state the number of packages wanted and of what dosage. The postoffice (or express office, if a large quantity is ordered) to which it is to be sent, must also be given. When antitoxin is received it should be kept in an ice chest, where possible, until needed.

It should be remembered that the success of antitoxin in the treatment of diphtheria depends largely upon its early use in sufficiently large doses.

Each package of antitoxin will contain a blank for a report of the case in which it is used. Physicians who receive antitoxin will be required to fill out this blank and return it to the State Board of Health. They must also certify that the antitoxin was used for a person of indigent circumstances.

Local boards of health are urged to make use of their authority, and this arrangement for supplying antitoxin for the prevention and cure of diphtheria. Physicians are frequently called to cases of diphtheria in poor families where the use of antitoxin would mean the saving of life, but where the family is too poor to purchase it. The physician should not be expected to furnish antitoxin at his own expense. Antitoxin is used to lessen the number of deaths from diphtheria and also to protect those who are exposed from having the disease. This is a public health measure for which the public can well afford to pay.

H. M. BRACKEN, M. D.,
Secretary.

By order of the Board.
January 9, 1907.

In April, 1909, the Lederle Laboratories agreed to establish antitoxin stations throughout the state, where antitoxin for the poor could be secured at the following rates·

1,000 unit	$0.55
3,000 unit	1.35
5,000 unit	2.00

The offer of a station was submitted to various municipal health officers by means of a circular letter, which read as follows:

April 12, 1909.

My Dear Doctor: You are aware of the fact that we have been acting as distributing agents for antitoxin, as shown by enclosed circular. Now, we have been considering the question with the Lederle Antitoxin Laboratories of having branch distributing stations established throughout the state. The method would be somewhat as follows:

Some druggist would be named (preferably chosen by you) to act as distributing agent for the Lederle Antitoxin Laboratories. Certain blanks for use when antitoxin is to be given out or sold would be furnished this agent in triplicate form. You would sign these triplicate forms; this is all that you would have to do. The agent (druggist) when he gave out a package of antitoxin would retain one of these forms for his own file and forward two to the Lederle Antitoxin Laboratories.

The Lederle Laboratories would make their own arrangements with the druggist after such party had been chosen. You would have very little trouble in the matter and it would be the means of supplying a cheap antitoxin for use in your vicinity for the poor. If you wish an antitoxin station, kindly advise me at once; also give us the name of a druggist in order that we may communicate same to the Lederle Antitoxin Laboratories. I might say that this plan is now in operation in Vermont.

Very truly,
(Signed) H. M. BRACKEN,
Executive Officer.

Following this action, forty-four antitoxin stations were established, as follows:

Place.	Health Officer in Charge.	Agent.
Aitkin	Dr. B. W. Kelly	Potter-Casey Co.
Albert Lea	Dr. W. A. Bessesen	Barlow & Spicer.
Appleton	Dr. D. W. Little	H. E. Fernald.
Argyle	Dr. J. Biederman	Walter Robertson.
Arlington	Dr. C. W. Kanne	A. W. Shurping.
Bemidji	Dr. L. A. Ward	E. A. Barker.
Benson	Dr. S. J. Froshaug	W. R. Smith.
Brainerd	Dr. R. A. Beise	H. P. Dunn.
Breckenridge	Dr. C. P. Rice	F. L. Pierce.
Caledonia	Dr. J. S. Collins	F. B. Collins & Co.
Cass Lake	Dr. G. A. Christensen	J. T. Gardner.
Cloquet	Dr. James Fleming	Kopp & Proulx.
Crookston	Dr. C. E. Dampier	S. A. Wallace & Co.
Detroit	Dr. J. E. Carman	Carman Drug Co.
Eveleth	Dr. N. C. Bulkley	Dr. N. C. Buckley.
Faribault	Dr. F. R. Huxley	Fred Lenz, Jr.
Fergus Falls	Dr. J. G. Vigen	J. H. Beise.
Hallock	Dr. J. B. Muir	A. P. T. Suffel.
Hibbing	Dr. C. E. Prudden	T. C. Congdon.
Howard Lake	Dr. E. Y. Chilton	H. A. Workman.
Long Prairie	Dr. G. R. Christie	Reichert & Shenk.
Luverne	Dr. C. L. Sherman	V. C. Mead.
Mankato	Dr. G. A. Dahl	Frank G. Thomas.
Marshall	Dr. J. S. Renninger	W. C. Haney.
Montgomery	Dr. James McKeon	John Kaisersatt.
New Ulm	Dr. J. H. Vogel	Arbes Bros.
Ortonville	Dr. B. R. Karn	John Nielson.
Pipestone	Dr. E. M. Carr	J. W. Cook.
Red Wing	Dr. G. C. Wellner	C. J. Bender.

Rochester	Dr. A. S. Adams	Weber & Heintz Co.
Rush City	Dr. C. E. Gray	W. F. Anderson.
St. Cloud	Dr. C. F. Brigham	B. F. Carter.
St. Peter	Dr. G. F. Merritt	J. A. Poetz.
Sauk Center	Dr. A. F. Moynihan	Hanson & Emerson.
Slayton	Dr. W. E. Richardson	Geo. H. Woodgate.
Tracy	Dr. W. H. Valentine	E. R. Dodds & Co.
Two Harbors	Dr. J. D. Budd	F. F. James.
Virginia	Dr. J. H. Crowe	Treadway Drug Co.
Wadena	Dr. C. E. Reeves	Anderson & Holly.
Walker	Dr. E. E. Holman	G. E. Crowe.
Warren	Dr. G. S. Wattam	North Star Drug Co.
Waseca	Dr. A. J. Rudolf	Preston & Stucke.
Willmar	Dr. J. M. Rains	A. R. Mossberg.

While these stations have undoubtedly increased the amount of antitoxin used. There still is some delay in its use among the poor because of its cost. Minnesota should supply antitoxin free for the poor. This could easily be done without great expense, it now being possible to purchase this product at a reasonable rate. The state should set aside $20,000 per annum for the next two years, this amount, or so much as necessary, to be used in the purchase and free distribution of antitoxin through the State Board of Health.

The report of cases is not perfect; therefore it is not possible to state the percentage of deaths among those affected, but a conservative estimate will place this at about 10 per cent. There were 574 deaths from this disease in 1908, and 557 deaths in 1909.

The death statistics for diphtheria during 1909 are shown in the following table:

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*Figures for cities over 5,000 population are printed in heavy faced type, but the same figures are included in the county line preceding.

TABLE No. III—

COUNTY	Total	Sex		Color			Time of Death											
		Male	Female	White	Black	Other Color	January	February	March	April	May	June	July	August	September	October	November	December
Aitkin	1	1		1									1					
Anoka	2	1	1	2										1	1			
Becker	3	2	1	3					1	1								1
Beltrami	2	1	1	2						1			1					
Benton	2	1	1	2								1			1			
Big Stone	2	1	1	2				1		1								
Blue Earth	6	4	2	6				1		1					1	2		1
Mankato	**4**	**2**	**2**	**4**				**1**								**1**	**2**	
Brown	2	2		2			1		1									
New Ulm																		
Carlton	7	5	2	7			1			1		2			2	1		
Cloquet	**4**	**3**	**1**	**4**								**2**			**2**			
Carver	5	4	1	5			1	1									1	2
Cass	3	3		3									1		2			
Chippewa	6	6		6			1							1				4
Chisago	1		1	1											1			
Clay	6	2	4	6				2	3	1								
Clearwater	3	2	1	3						1			1		1			
Cook																		
Cottonwood																		
Crow Wing	9	1	8	9			1							4	1	1	1	1
Brainerd	**8**		**8**	**8**			**1**							**4**		**1**	**1**	**1**
Dakota	4	2	2	4				1	1						1			1
Dodge	3	1	2	3						2				1				
Douglas	1	1		1									1					
Faribault	1	1		1											1			
Fillmore	1		1	1											1			
Freeborn	7	2	5	7						1		2		1		2	1	
Albert Lea	**7**	**2**	**5**	**7**						**1**		**2**		**1**		**2**	**1**	
Goodhue	4	3	1	4			1								3			
Red Wing																		
Grant																		
Hennepin	112	55	57	112			14	8	6	5	4	5	2	2	20	22	15	19
Minneapolis	**106**	**52**	**54**	**106**			**14**	**8**	**6**	**5**	**4**	**5**	**1**	**2**	**9**	**20**	**14**	**18**
Houston	2	1	1	2													2	
Hubbard	6	5	1	6						1		1			1	3		
Isanti	2	1	1	2			1			1								
Itasca	6	3	3	6				1			1			2	1			1
Jackson																		
Kanabec																		
Kandiyohi	3	1	2	3					1					1				1
Kittson	4	3	1	4						3					1			
Koochiching																		
Lac Qui Parle	5	4	1	5						2		1				1	1	
Lake	1	1		1														1
Le Sueur	2	2		2					1									1
Lincoln																		
Lyon	2		2	2							1		1					
McLeod	5	4	1	5						1	2						1	1
Mahnomen	3	2	1	3					2				1					
Marshall	2	1	1	2					2									
Martin	3		3	3			1								1	1		
Meeker	2		2	2				2										
Mille Lacs	2	1	1	2						1								1
Morrison	12	7	5	12			3	3	1		1		4					
Little Falls	**1**	**1**		**1**				**1**										
Mower	1	1		1										1				
Austin																		
Murray																		
Nicollet	1	1		1													1	
St. Peter																		
Nobles																		
Norman	4	4		4						1		1	1		1			
Olmsted																		
Rochester																		
Otter Tail	11	7	4	11			3			3			1			2		2
Fergus Falls	**1**	**1**		**1**			**1**											
Pine	6	6		6			2	1	2				1					
Pipestone	3	1	2	3			1		1			1						
Polk	4	1	3	4					1			1	1	1				

DIPHTHERIA, 1909

Age												Conjugal Condition				Birth Place			
Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Wid.or Div.	Not Given	Minnesota	Other U. S.	Foreign	Not Given
	1											1				1			
		2										2			2				
		1	1	1								3				3			
			1	1								2				1	1		
	1			1								2				1	1		
		1	1									2				2			
		2		3			1					5	1			4	1	1	
		1		**2**			**1**					**3**	**1**			**2**	**1**	**1**	
		1		1								2				2			
	1	1	3	2								7				5	1	1	
		1	**2**	**1**								**4**				**3**		**1**	
		2	2	1								5				5			
			2	1								3				3			
3		1	1			1						6				5	1		
				1								1					1		
1		3	2									6				2	4		
1		2										3				2	1		
		5	2	2								9				9			
		5	**2**	**1**								**8**				**8**			
		1	1	2								4				4			
1		1	1									3				3			
				1								1				1			
			1									1				1			
				1								1				1			
1		2	2	1	1							7				5	2		
1		**2**	**2**	**1**	**1**							**7**				**5**	**2**		
		3		1								4				4			
4	10	38	33	19	3		1	3	1			106	5	1		89	16	5	2
3	**10**	**36**	**32**	**18**	**3**			**3**	**1**			**101**	**4**	**1**		**84**	**16**	**4**	**2**
		1		1								2				2			
	2	2	2									6				4	2		
				2								2				2			
			3	2		1						6				5	1		
1				2								3				2	1		
		1	2	1								4				3	1		
			3	2								5				5			
			1									1					1		
			1	1								2				2			
		1					1					1	1				2		
	3	1		1								5				5			
		1	1	1								3				3			
		1		1								2				2			
1		1	1									3				3			
			2									2				2			
	1	1										2				2			
		2	3	6	1							12				12			
		1										**1**				**1**			
				1								1				1			
			1									1				1			
		2	1	1								4				4			
	2	1	6	2								11				10		1	
		1										**1**				**1**			
1	1	1	1	2								6				4	2		
		1	1	1								3				3			
		2	2									4				3	1		

TABLE NO. III—

COUNTY	Total	Sex		Color			Time of Death											
		Male	Female	White	Black	Other Color	January	February	March	April	May	June	July	August	September	October	November	December
Crookston	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Pope	4	2	2	4	....	....	2	....	1	....	....	....	....	....	1	....	....	....
Ramsey	114	58	56	111	3	....	9	9	16	5	11	4	3	8	6	7	21	15
St. Paul	111	56	55	108	3	....	9	9	16	5	10	4	3	7	6	7	21	14
Red Lake	3	1	2	3	....	....	....	....	1	....	....	....	....	....	1	....	....	1
Redwood	3	3	....	3	....	....	....	....	....	1	....	....	1	....	....	....	....	1
Renville	6	4	2	6	....	....	....	....	....	....	1	1	2	....	....	2	....	....
Rice	8	3	5	8	....	....	2	....	2	....	....	....	....	2	....	....	2	....
Faribault	5	3	2	5	....	....	2	....	....	....	....	....	....	2	....	....	1	....
Rock	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Roseau	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
St. Louis	83	44	39	83	....	....	9	4	7	6	7	13	1	6	9	7	8	6
Duluth	34	18	16	34	....	....	5	3	1	5	3	7	....	3	1	2	3	1
Eveleth	1	1	....	1	....	....	....	....	....	....	....	....	....	....	1	....	....	....
Hibbing	10	5	....	5	....	....	2	1	1	....	....	1	....	1	....	2	....	2
Virginia	5	4	1	5	....	....	....	....	....	1	....	....	....	....	1	....	3	....
Scott	2	2	....	2	....	....	....	1	....	....	....	1	....	....	....	....	....	....
Sherburn	1	1	....	1	....	....	....	....	1	....	....	....	....	....	....	....	....	....
Sibley	3	3	....	3	....	....	....	....	....	....	....	1	....	1	....	....	....	1
Stearns	13	6	7	13	....	....	2	1	1	....	....	....	1	....	3	1	3	1
St. Cloud	4	2	2	4	....	....	1	....	....	....	....	....	....	....	1	1	1	....
Steele	6	2	4	6	....	....	1	....	2	....	....	....	....	....	....	1	....	2
Owatonna	2	2	....	2	....	....	1	....	....	....	....	....	....	....	....	1	....	....
Stevens	4	1	3	4	....	....	1	....	1	....	....	....	....	1	....	....	1	....
Swift	2	2	....	2	....	....	....	....	....	....	1	....	....	1	....	....	....	....
Todd	5	4	1	5	....	....	1	....	....	1	....	....	3	....	....	....	....	....
Traverse	1	1	....	1	....	....	....	....	....	....	....	....	1	....	....	....	....	....
Wabasha	1	....	1	1	....	....	....	1	....	....	....	....	....	....	....	....	....	....
Wadena	2	1	1	2	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Waseca	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Washington	4	4	....	4	....	....	2	....	....	1	....	1	....	....	....	....	....	....
Stillwater	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Watonwan	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Wilkin	1	....	1	1	....	....	1	....	....	....	....	....	....	....	....	....	....	....
Winona	2	....	2	2	....	....	1	....	....	....	....	....	....	....	....	....	1	....
Winona	2	....	2	2	....	....	1	....	....	....	....	....	....	....	....	....	1	....
Wright	5	2	3	5	....	....	1	....	2	....	....	....	....	....	....	1	1	....
Yellow Medicine	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Total	558	302	256	555	3	....	63	37	57	41	29	36	29	34	52	54	60	66

DIPHTHERIA, 1909—Continued

Age												Conjugal Condition				Birth Place			
Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Wid.orDiv.	Not Given	Minnesota	Other U. S.	Foreign	Not Given
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	......	......	......	......	......
2	....	....	1	....	1	....	....	....	....	....	....	4	....	....	......	3	......	1	......
6	7	40	35	19	4	2	1	....	....	....	....	110	3	1	......	58	51	5	......
6	7	40	32	19	4	2	1	....	....	....	....	107	3	1	......	55	51	5	......
....	1	....	1	1	....	....	....	....	....	....	....	3	....	....	......	3	......	......	......
....	....	1	....	2	....	....	....	....	....	....	....	2	....	....	1	2	1	......	......
....	....	1	1	2	1	1	....	....	....	....	....	4	2	....	......	5	1	......	......
....	....	2	1	4	....	1	....	....	....	....	....	8	....	....	......	6	......	1	1
....	....	....	....	4	....	1	....	....	....	....	....	5	....	....	......	4	......	......	1
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	......	......	......	......	......
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	......	......	......	......	......
6	11	24	24	13	5	....	....	....	....	....	....	81	2	....	......	66	14	3	......
4	3	6	12	8	1	....	....	....	....	....	....	34	....	....	......	25	8	1	......
....	....	1	....	....	....	....	....	....	....	....	....	1	....	....	......	1	......	......	......
....	2	4	....	1	3	....	....	....	....	....	....	9	1	....	......	6	3	1	......
....	2	2	1	....	....	....	....	....	....	....	....	5	....	....	......	4	1	......	......
....	....	....	2	....	....	....	....	....	....	....	....	2	....	....	......	2	......	......	......
....	1	....	....	....	....	....	....	....	....	....	....	1	....	....	......	1	......	......	......
....	1	....	2	....	....	....	....	....	....	....	....	3	....	....	......	3	......	......	......
....	1	3	7	1	1	....	....	....	....	....	....	13	....	....	......	12	1	......	......
....	....	1	3	....	....	....	....	....	....	....	....	4	....	....	......	4	......	......	......
....	....	....	2	3	1	....	....	....	....	....	....	6	....	....	......	5	1	......	......
....	....	....	....	2	....	....	....	....	....	....	....	2	....	....	......	1	1	......	......
....	....	1	2	....	....	1	....	....	....	....	....	3	1	....	......	4	......	......	......
....	....	1	1	....	....	....	....	....	....	....	....	2	....	....	......	2	......	......	......
1	....	....	1	1	1	1	....	....	....	....	....	4	1	....	......	4	1	......	......
....	....	....	....	1	....	....	....	....	....	....	....	1	....	....	......	1	......	......	......
....	....	....	1	....	....	....	....	....	....	....	....	1	....	....	......	1	......	......	......
....	....	1	....	1	....	....	....	....	....	....	....	2	....	....	......	2	......	......	......
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	......	......	......	......	......
....	....	2	2	....	....	....	....	....	....	....	....	4	....	....	......	4	......	......	......
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	......	......	......	......	......
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	......	......	......	......	......
....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	1	1	......	......	......
....	1	1	....	....	....	....	....	....	....	....	....	2	....	....	......	1	1	......	......
....	1	1	....	....	....	....	....	....	....	....	....	2	....	....	......	1	1	......	......
....	1	2	....	2	....	....	....	....	....	....	....	5	....	....	......	5	......	......	......
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	......	......	......	......	......
29	46	164	167	116	19	9	4	3	1	....	....	538	16	2	2	426	110	19	3

TYPHOID FEVER.

This, another germ disease, is entirely too general throughout Minnesota. It is a filth disease, the germ escaping from the body of the patient with the excreta (faeces or urine), and reaching its victims by way of his or her mouth, being taken in with the food or drink. The germs of typhoid fever reach the food through the agency of those who prepare it (cook, parent or nurse), through those handling food supplies (dairymen, farmers, gardeners, etc.), or through flies passing from infected excreta to the unprotected food in kitchens, storerooms, etc. The germs reach the drinking water supply through the pollution of wells, or other sources of water supply, with infected sewage. The general tendency in the past has been to attribute a very large proportion of the typhoid fever to infected drinking water. While the drinking water has an important place in the spread of typhoid fever, it causes but a minor portion of the infections, the greater number of cases being caused by direct infection from person to person (contact cases) or the infection of food by flies.

The statistics for typhoid fever in Minnesota are shown on the attached tables. A comparison of its death rate with other sections of this country and foreign countries is also given. Typhoid fever furnishes about as many cases per annum in Minnesota as does tuberculosis. The death rate, fortunately, is much lower. The condition is one, however, demanding the greatest attention. Probably water companies and municipalities will awaken to their responsibilities, in Minnesota at least, as a result of the recent opinion from the supreme court of Minnesota in relation to the Mankato typhoid fever epidemic of 1908. The decision reads as follows:

STATE OF MINNESOTA,

Supreme Court, April Term, A. D. 1910.

DELIA KEEVER, as Administratrix,
Appellant.
v.
THE CITY OF MANKATO,
Respondent.

KATE FLANAGAN, as Administratrix,
Appellant.
v.
THE CITY OF MANKATO,
Respondent.

SYLLABUS.

A complaint charged that defendant city negligently allowed the supply in its water works system to become polluted with poisonous substances and large quantities of filth and sewage to escape into and saturate its water supply, by reason whereof plaintiff's intestate contracted typhoid fever and died as a consequence.

On demurrer it is held: (1) The municipality was liable for its negligence in its private or corporate capacity, and was not exempt because it was carrying out a governmental function.

(2) Under section 4403 an administrator of a person whose death was due to the wrongful act of a municipality may maintain an action for dam-

ages consequent thereon. Malone v. City, 40 Minn., 406; Orth v. Village, 87 Minn., 207, followed.

Reversed.

STATE OF MINNESOTA,

Supreme Court, April Term, A. D. 1910.

DELIA KEEVER, as Administratrix,
Appellant.
v.
THE CITY OF MANKATO,
Respondent.

KATE FLANAGAN, as Administratrix,
Appellant.
v.
THE CITY OF MANKATO,
Respondent.

OPINION.

This is an action for death by wrongful act occasioned by the negligence of the defendant city.

The complaint alleged that defendant, a municipal corporation, negligently allowed waters and the water supply in its water works system to become infected and polluted with poisonous substances "and large quantities of filth and sewage, all of which were saturated with the germs of diseases * * * and did carelessly, negligently * * * permit * * * filthy, foul and dangerous substances, common sewage and other filth to escape into and saturate the water supply:" that by reason thereof the water became imminently dangerous to life and health of which defendant had full notice and knowledge that plaintiff's intestate, a citizen and resident used the water, contracted typhoid fever and died in consequence. The complaint set forth additional facts as the right of the administrator to recover. Defendant's demurrer to plaintiff's complaint was sustained. From that order the plaintiff appeals. It is to be noted that the complaint in the case at bar set forth not a mere action against the defendant to recover damages because the city failed to provide an adequate supply of pure water. The question here is whether the city is liable for, among other things, recklessly causing dangerous substances like common sewage and other filth to saturate its water supply and the wells, mains and appurtenances thereto.

The first essential question is whether the city is exempt because it was carrying out a governmental function, or whether it is liable because it operated the water works in its private or corporate function.

The defendant naturally insists that it was performing merely a governmental function. There is ambiguity in that term as used in this connection. It may mean that the operation of water works by a municipality is intro vires as distinguished from ultra vires or it may mean that such function is public as distinguished from private or proprietary, in which capacity the city may voluntarily assume for business purposes and for its own advantage to conduct certain operations and is held responsible for negligence therein, although the work is done ultimately for the benefit of its citizens. Many of the authorities to which defendant refers us properly hold that a city may properly operate water works. They have no tendency whatever to determine whether or not the city is or is not exempt in its operation of water works.

Defendant also insists that the city can make no profit out of its operation of these water works. Doubtless this is in a general way true; at all events it may be here admitted. But the sequence which defendant seeks to draw does not at all follow; i. e., that therefore it should be exempted from all liability for mismanagement. For the city is liable for neglect in connection with its streets, sidewalks and sewers, from which in their very nature no profit is or can be made. The city operates the water works for profit in the sense that it is voluntarily engaged in the same business which when conducted by private persons is operated for profit. The city itself makes a reasonable and varying charge. The undertaking is partly commercial. It is enough that the city is in a profit-making business. "The city is exercising a special privilege for its own benefit and advantage although a portion of the water is used by the city for protection against fire and in promoting the public health." Hammersley, J., in Horrigan v. Norwich, 77 Conn. 358. The English authorities regard cities in such matters as "substitutions on a large scale for individual enterprises." Mr. Justice Blackburn in Mercey Dock Trustees v. Gibbs, L. R. 1 Eng. & Ir. App. cases at page 107 approving Mr. Justice Mellor in Coy v. Wise, 5 B. & S. 440.

Finally defendant insists that it would not be sound policy to open the door and permit actions like the present to be maintained for the reason that as a result the defendant city as well as any other city would be liable at any time to have the same misfortune and would be bankrupted thereby. The assessed valuation of the city is less than $4,000,000. If the city is not exempted from liability it is subject to claims of the same nature as the present amounting to over $10,000,000. Thus the very existence of the city is threatened and the city subjected to total destruction, which could be of no proportionate advantage to the individuals who suffered. It readily suggests itself as an answer to this dark prognostication that the number and nature of these cases does not appear in the record and is not known to the court; besides for the purposes of this case the neglect of defendant is necessarily assumed.

To the defendant, under the law, a number of defenses are available. How conclusive they may be in fact is wholly beyond any conjecture which we can recognize. Accordingly we must regard defendant's figures as purely hypothetical. The question is one of general principles recognized by the law and not of the private views of court or counsel as to what the convenience or necessity of a particular city may dictate under particular circumstances. The general experience of public and private water works is that ordinarily their operation involves no such financial disaster as defendant portrays. It is obvious that a sound public policy holds a city to a high degree of faithfulness in providing an adequate supply of pure water. Nor does it appear why the citizens should be deprived of the stimulating effects of the fear of liability on the energy and care of its officials; nor why a city should be exempt from liability while a private corporation under the same circumstances should be held responsible for its conduct and made to contribute to the innocent persons it may have damaged. As Elliott, J., said in East Grand Forks v. Luck, 97 Minn., 373, "When the municipality enters the field of ordinary private business, it does not exercise governmental powers. Its purpose is, not to govern the inhabitants, but to make for them and itself private benefit.

"As far as the nature of the powers exercised is concerned, it is immaterial whether the city owns the plant and sells the water, or contracts with a private corporation to supply the water. It is not in either case exercising a municipal function. * * * * * * * When a municipality engages in a private enterprise for profit, it should have the same rights and be subject to the same liabilities as private corporations or individuals." See Powell v. Duluth, 91 Minn., 53; Ferguson v. Doran, 103 Minn., 43; State ex rel. v. Board Water & Light, 105 Minn., 472. Thus in Wiltse v. Red Wing, 99 Minn., 255, a city operating the water works was held liable for water escaping from an embankment under the rule, in Rylands v. Fletcher. "For," said Start, C. J., "Although a municipal corporation, it was engaged in the business of supplying water to its inhabitants for profit, an undertaking of a private nature."

This is undoubtedly the general rule. See Piper v. Madison, 122 N. W. 730; Park Commissioners v. Common Council, 28 Mich. 229; Baily v. Mayor, 3 Hill 531. (As to the reasoning of this case, however, see Darlington v. The Mayor, 31 N. Y. 164-198, Cf.; Messane v. Mayor, 150 N. Y. 123; Aldrich

v. Tripp, 23 Am. 434; Ill. Trust Co. v. Kansas City, 76 Fed. 271, 282; Winona v. Botset, 169 Fed. 321; Judson v. Wingstead, 68 Atl. 999; Wagner v. Rhode Island, 21 L. R. A. 522; Esberg v. Portland, 43 L. R. A. 435; Brown v. Salt Lake City, 14 L. R. A. n. s. 619; Horrigan v. Norwich, 77 Conn. 358; Syracuse v. Springfield, 174 Mass. 430; City of Chicago v. Selz, Schwab & Co., 202 Ill. 545; Philadelphia v. Gelmarlieu, 71 Pa. 141; Springfield Fire & Marine Ins. Co. v. Village of Keeseville, 42 N. E. 405; Asher v. Hutchinson & C. Co., 61 L. R. A. 58.

The cases in which a city has been held responsible or irresponsible for damages by fire consequent upon an adequate supply of water are in a class of cases by themselves. From many points of view the rule holding the city liable for its negligence is not consistent with the rule there announced. The law does not undertake to achieve the impossible. As was said in Gould v. Winona Gas Co., 100 Minn. 268, pp. 264, "It is evident that the ultimate justification of the inapplicability of the rule (there in question) lies in the controlling regard of the common law not for doctrine but for common sense. Its paramount object is to work out substantial and not physical justice. Its just claim to distinction is to be found not in the logical consistency of its applied theories but in the practical wisdom with which it his adapted its rules to varying subject-matter and conditions."

Defendant also argues that in no case has the city been held liable for negligence in the operation of its water works unless the act involved a trespass, or an invasion or a direct property right. Thus water escaping from a city reservoir runs onto another's property and does damage; this is trespass and there is liability. Wiltse v. Red Wing (supra). But if the escaping water should do damage to a person and a public highway there would be no trespass but the law would recognize liability. Liability of the city is recognized in the case of streets and sidewalks which cannot properly involve trespass. Nor has defendant shown any reason for imposing liability, in the case of trespass or the breach of insurance of safety which does not logically apply to cases of negligence. On general principles liability for negligence is more just and more generally recognized because it is based upon culpability.

(2) The question then arises whether upon the assumption that plaintiff's intestate could have maintained an action against the defendant city had he lived, can his executor maintain an action under our statutes, Section 4403, Revised Statutes, provides "when death is caused by the wrongful act or omission of any person or corporation the personal representative of the decedent may maintain an action therefor if he might have maintained an action had he lived, for an injury caused by the same act or omission." Defendant has pressed upon us very earnestly that "corporation" as here used refers only to private corporations. (See Sec. 2839, Revised Laws 1905), and does not include municipal corporations. The matter is not de novo in this state. In Malone v. City of St. Paul, 40 Minn. 406, and in Orth v. Village, 87 Minn. 237, the administrators of deceased persons were allowed to pursue the statutory action against the city for negligence causing death. Such has been the settled construction in practice for many years. We do not feel at liberty to change that construction.

Reversed. (Signed) Jaggard, J.

Fortunately, typhoid fever has a very low death rate in Minnesota. Because of the failure to report all cases, it is impossible to give the exact mortality among those affected. A conservative estimate places this at about 4 per cent. In some of the epidemics it has been lower than this; in some higher.

The loss from typhoid fever in Minnesota may be roughly shown as follows:

LOSS FROM TYPHOID FEVER.

(A) In a single city; population about 10,000:

Loss of industrial capital from death of workers....	$322,460.00
Loss of time of adults, estimated at $10 per week, on account of illness	22,620.00
Expense of illness (estimated).....................	30,360.00
Total	$375,440.00

The above total represents only certain types of losses—not total losses—through one epidemic in a single city.

Number of cases	460
Number of deaths	30
Death rate among above cases.....................	6.52%

(B) Throughout the state, 1887-1907 (21 years):

Loss of time of adults, estimated as above, on account of illness	$13,725,280.00
Expense of illness (estimated).....................	18,433,800.00
Total	$32,159,080.00
Number of cases (estimated).......................	279,300
Number of deaths	9,776
Death rate among above cases.....................	3.5%

(C) Throughout the state, 1907:

Loss of time of adults, estimated as above, on account of illness	$492,000.00
Expense of illness (estimated).....................	660,000.00
Total	$1,152,000.00
Number of cases (estimated).......................	10,000
Number of deaths.................................	350
Death rate among above cases.....................	3.5%

Note.—Children, estimated at 18% of cases, not included in wage losses as estimated above.

Tuberculosis, diphtheria and typhoid fever may be conveniently studied from the preventive standpoint in the following comparative table:

A GROUP OF DISEASES CAUSED BY GERMS.

Pulmonary Tuberculosis	Other Forms of Tuberculosis	Diphtheria	Typhoid Fever
A specific germ	A specific germ	A specific germ	A specfic germ
In expectorate	In discharges	In expectorate and discharges from nose	In excreta
Chronic	Chronic	Acute	Acute

Sources of Danger for all of the Above.

The sick	The sick	The sick	The sick
The early, light and unrecognized cases		The early, light and unrecognized cases	The early, light and unrecognized cases
The convalescent		The convalescent	The convalescent
		Immune carriers	Immune carriers
Infected dirt	Infected dirt	Infected dirt	Infected dirt
Soiled clothing	Soiled clothing	Soiled clothing	Soiled clothing
Common drinking cups		Common drinking cups	Common drinking cups
Pencils, etc.		Pencils, etc.	Pencils, etc.
Diseased meat			
Diseased milk			
Infected milk	Infected milk	Infected milk	Infected milk
Infected food	Infected food	Infected food	Infected food
			Infected water
Flies	Flies	Flies	Flies

To Prevent all of These.

Educate the people as to the means of infection.

No quarantine necessary for any of them if properly handled.

Isolation		Isolation	Isolation
Sanatoria	Special	Isolation	Isolation
Special hospitals	Hospitals	Hospitals	Hospitals.
Care on part of	patient not to	scatter	germs
Care on part of	nurse and others	not to scatter	germs
		Care on part of	immune carriers
Care	on part	of	physician
Care	on part	of sanitary	authorities
Care	on part	of the	public
Care	on part	of school	authorities

The typhoid fever death statistics for Minnesota during 1909 are as follows:

TABLE No. IV—TYPHOID

COUNTY	Total	Sex		Color			Date of Death											
		Male	Female	White	Black	Other Color	January	February	March	April	May	June	July	August	September	October	November	December
Aitkin	1	1		1					1									
Anoka	3	2	1	3				1							2			
Becker	1	1		1					1									
Beltrami	5	4	1	5						1							3	1
Benton	2	2		2							1							1
Big Stone																		
Blue Earth	4	2	2	4								1			2			1
Mankato	3	2	1	3											2			1
Brown	1	1		1													1	
New Ulm																		
Carlton	6	3	3	6			1							1	1		2	1
Cloquet	5	3	2	5										1	1		2	1
Carver																		
Cass	1		1	1			1											
Chippewa																		
Chisago	1		1	1														1
Clay	8	4	4	8							1	1	1		1	1	1	2
Clearwater	1	1		1												1		
Cook																		
Cottonwood	2	2		2					1							1		
Crow Wing	14	11	3	14			2		1			1				4	4	2
Brainerd	14	11	3	14			2		1			1				4	4	2
Dakota																		
Dodge																		
Douglas																		
Faribault	3	3		3											1	1		1
Fillmore	1		1	1				1										
Freeborn	1	1		1													1	
Albert Lea	1	1		1													1	
Goodhue	3	2	1	3							1				1			1
Red Wing	3	2	1	3							1				1			1
Grant	1	1		1													1	
Hennepin	70	42	28	70			1	1	10	8	3	5	1	4	11	11	5	10
Minneapolis	66	42	24	66			1	1	10	7	3	5	1	4	10	10	5	9
Houston	3	2	1	3			1						1				1	
Hubbard	1		1	1													1	
Isanti																		
Itasca	3	3		3					1			1	1					
Jackson	1	1		1					1									
Kanabec																		
Kandiyohi	2		2	2				1			1							
Kittson																		
Koochiching																		
Lac Qui Parle																		
Lake	7	4	3	7			1				2			1		1	2	
Le Sueur																		
Lincoln	3	1	2	3				1										2
Lyon	5	2	3	5						1		1		1		1		1
McLeod	1	1		1										1				
Mahnomen	1		1	1												1		
Marshall	7	6	1	7				1	1	1							4	
Martin	2		2	2					1						1			
Meeker	1		1	1														1
Mille Lacs	1	1		1											1			
Morrison	2		2	2									1					1
Little Falls	2		2	2									1					1
Mower	1		1	1								1						
Austin																		
Murray																		
Nicollet	9	2	7	9			1			3	1				1		1	2
St. Peter	8	1	7	8			1			3	1				1		1	1
Nobles	1		1	1					1									
Norman	3	2	1	3											1	2		
Olmsted																		
Rochester																		
Otter Tail	7	5	2	7			2									2	2	1
Fergus Falls	4	3	1	4			2									1	1	
Pine																		
Pipestone	3		3	3			1				1		1					

FEVER 1909

Age													Conjugal Condition				Birth Place			
Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Not given	Single	Married	Wid.or Div.	Not Given	Minnesota	Other U. S.	Foreign	Not Given
							1						1					1	1	
		1			2								2	1			2		1	
				1									1				1			
		1			4								4	1			2	1	2	
				1	1								2				2			
					1	1	1	1					1	2	1		2	1	1	
					1		1	1					1	1	1		1	1	1	
					1								1				1			
			1	1	2	2							3	2		1	3	1	2	
			1	1	1	2							3	2			3	1	1	
					1									1				1		
				1									1				1			
		1		2	1	3			1				5	2	1		4		4	
							1							1			1			
							2							1	1			2		
			1	3	3	3	1	2				1	6	2		6	3	1	2	8
			1	3	3	3	1	2				1	6	2		6	3	1	2	8
			1		2								2	1			2			1
							1							1			1			
						1								1				1		
						1								1				1		
				1	2								3				2		1	
				1	2								3				2		1	
								1						1					1	
	3	2	3	11	35	10	1	4	1				44	19	2	5	24	16	26	4
	3	2	2	10	33	10	1	4	1				40	19	2	5	21	16	25	4
				1	1			1					1	1	1		3			
					1									1					1	
					1		1		1				2	1					3	
				1									1				1			
		1			1								2				2			
				1	3	3							4	2	1			1	6	
			1		1	1							2		1		1	1	1	
				1	2	2							3	2			2	2		1
						1							1					1		
					1								1					1		
		1		1	4	1							6	1			7			
				2									2				2			
					1								1					1		
								1						1					1	
		1			1								2				2			
		1			1								2				2			
				1									1					1		
					3	1	2	1	2				4	2	3		1	1	6	1
					2	1	2	1	2				3	2	3		1		6	1
							1							1					1	
				2	1								2	1			1		2	
				2	1	3	1						4	2	1		5	1	1	
				1	1	1	1						3	1			4			
				2	1								2	1			3			

TABLE No. IV—TYPHOID

COUNTY	Total	Sex		Color			Date of Death											
		Male	Female	White	Black	Other Color	January	February	March	April	May	June	July	August	September	October	November	December
Polk	11	7	4	11				1		1	1	1			1	3	3	
Crookston	**6**	**3**	**3**	**6**				**1**			**1**				**1**	**2**	**1**	
Pope	1		1	1						1								
Ramsey	39	25	14	37	2		3	2		1	5	1		4	7	6	4	6
St. Paul	**39**	**25**	**14**	**37**	**2**		**3**	**2**		**1**	**5**	**1**		**4**	**7**	**6**	**4**	**6**
Red Lake	19	8	11	19			1	6	3	1			1	1		4	2	
Redwood	1		1	1			1											
Renville	1	1		1											1			
Rice	4	4		4				1	1					1			1	
Faribault	**3**	**3**		**3**				**1**	**1**					**1**				
Rock	2	2		2					1								1	
Roseau	4	3	1	4			1	1			1		1	1				
St. Louis	77	61	16	77			2	1	6	4	3	9	3	1	14	15	10	9
Duluth	**38**	**32**	**6**	**38**			**1**	**1**	**5**	**2**	**3**	**4**	**1**	**1**	**6**	**8**	**3**	**3**
Eveleth	**4**	**3**	**1**	**4**											**2**			**2**
Hibbing	**8**	**7**	**1**	**8**			**1**			**2**						**3**	**2**	
Virginia	**12**	**10**	**2**	**12**					**1**			**1**	**1**		**3**	**1**	**4**	**1**
Scott	2	2		2					1								1	
Sherburne	1	1		1						1								
Sibley																		
Stearns	9	8	1	9				2							2	1		4
St. Cloud	**4**	**4**		**4**				**1**							**2**			**1**
Steele	1	1		1			1											
Owatonna	**1**	**1**		**1**			**1**											
Stevens																		
Swift	1	1		1												1		
Todd	2	1	1	2												1		1
Traverse	1	1		1														1
Wabasha	2	2		2								1	1					
Wadena	3	3		3					1						1	1		
Waseca	1	1		1											1			
Washington	3		3	3										1		1	1	
Stillwater	**2**		**2**	**2**												**1**	**1**	
Watonwan																		
Wilkin	8	6	2	8			1	4	2							1		
Winona	2	2		2								1			1			
Winona	**1**	**1**		**1**											**1**			
Wright	5	2	3	5			2	1					1	1				
Yellow Medicine																		
Total	393	255	138	391	2		23	25	34	23	21	24	12	18	51	60	52	50

Note: Figures for cities over 5,000 population are printed in heavy faced type, but the same figures are included in the county line preceding.

FEVER, 1909—Continued

Age													Conjugal Condition				Birth Place			
Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Not given	Single	Married	Wid.or Div.	Not Given	Minnesota	Other U. S.	Foreign	Not Given
1	1	....	....	2	2	1	4	....	....	....	....	....	5	4	....	2	6	3	2	....
1	....	....	....	....	2	1	2	....	....	....	....	....	3	3	....	....	2	2	2	....
....	....	....	....	....	....	....	....	1	....	....	....	....	....	1	....	....	....	....	1	....
....	....	....	4	11	13	8	1	2	....	....	....	....	26	12	1	....	5	24	10	....
....	....	....	4	11	13	8	1	2	....	....	....	....	26	12	1	....	5	24	10	....
....	....	1	2	5	5	2	1	2	1	....	....	....	14	5	....	....	13	2	3	1
....	....	....	....	....	....	....	....	1	....	....	....	....	....	1	....	....	....	....	1	....
....	....	....	....	1	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....
....	....	....	....	1	....	1	....	....	2	....	....	....	2	2	....	....	1	1	2	....
....	....	....	....	1	....	....	....	....	2	....	....	....	1	2	....	....	....	1	2	....
....	....	....	....	....	1	....	....	....	1	....	....	....	....	2	....	....	....	....	1	1
....	....	....	....	3	....	....	1	....	....	....	....	....	3	1	....	....	1	2	1	....
....	....	3	2	8	39	19	3	2	1	....	....	....	53	18	5	1	10	11	55	1
....	....	....	2	3	20	10	1	1	1	....	....	....	31	7	....	....	6	4	28	....
....	....	....	....	....	3	1	....	....	....	....	....	....	1	3	....	....	....	....	4	....
....	....	....	....	2	3	3	....	....	....	....	....	....	6	1	1	....	2	2	4	....
....	....	1	....	1	7	2	1	....	....	....	....	....	7	1	4	....	....	2	9	1
....	....	....	....	....	....	2	....	....	....	....	....	....	2	....	....	....	2	....	....	....
....	....	....	....	....	....	....	....	1	....	....	....	....	....	1	....	....	....	....	1	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	1	1	2	4	....	....	....	1	....	....	....	5	....	1	3	6	2	1	....
....	....	1	....	....	3	....	....	....	....	....	....	....	3	....	....	1	3	....	1	....
....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	1	....	1	....	....	....
....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	1	....	1	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	1	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....
....	....	....	....	....	....	1	....	1	....	....	....	....	....	1	1	....	1	....	1	....
....	....	....	....	....	....	1	....	....	....	....	....	....	....	1	....	....	....	1	....	....
....	....	....	....	1	1	....	....	....	....	....	....	....	2	....	....	....	1	1	....	....
....	....	....	....	2	1	....	....	....	....	....	....	....	3	....	....	....	2	....	1	....
....	....	....	....	....	....	1	....	....	....	....	....	....	1	....	....	....	1	....	....	....
....	....	1	....	1	1	....	....	....	....	....	....	....	3	....	....	....	2	1	....	....
....	....	....	....	1	1	....	....	....	....	....	....	....	2	....	....	....	1	1	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	1	2	5	....	....	....	....	....	....	4	4	....	....	2	4	2	....
....	....	....	....	....	2	....	....	....	....	....	....	....	2	....	....	....	1	1	....	....
....	....	....	....	....	1	....	....	....	....	....	....	....	1	....	....	....	....	1	....	....
....	....	....	....	3	....	1	1	....	....	....	....	....	4	1	....	....	2	2	1	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
1	4	14	16	77	150	74	24	21	11	....	....	1	248	106	21	18	140	89	146	18

TABLE NO. V.

1909 Loss from Typhoid Deaths.

Age	No.	Value	Total Value
0- 4	19	$520	$9,880
5- 9	16	1,475	23,600
10–19	78	3,000	234,000
20–29	150	4,050	607,500
30–49	97	3,500	339,500
50–80	33	1,100	36,300
Total	393		$1,250,780

TABLE NO. VI.

Deaths from Typhoid Fever

Year	Minneapolis	St. Paul	*Duluth
1888	156	135	78
1889	114	101	48
1890	65	74	42
1891	100	65	71
1892	84	57	41
1893	146	59	53
1894	101	37	70
1895	86	41	101
1896	67	43	112
1897	157	25	43
1898	89	46	34
1899	77	32	22
1900	79	39	62
1901	132	24	35
1902	65	24	32
1903	101	18	40
1904	103	27	39
1905	55	20	32
1906	87	41	32
1907	70	36	29
1908	53	27	41
1909	66	39	38

***Duluth gets a great many typhoid fever cases from outlying districts.**

TABLE NO. VII

Deaths from Typhoid Fever in Minnesota Cities

City or Village	1906	1907	1908	1909
Albert Lea	1	1		1
Anoka		3		1
Austin	1	2	2	
Barnesville				1
Bemidji	1	1	3	
Blue Earth	3			
Brainerd	16	12	12	14
Breckenridge	8	5	5	6
Chaska			1	
Chatfield				
Chisholm	2			4
Cloquet		1	5	5
Crookston	6	5	9	6
Detroit	3	1	1	1
Duluth	34	30	41	38
East Grand Forks	1			
Ely	1	2		1
Eveleth	8	5	2	4
Faribault	1	1	2	3
Fairmont	1			
Fergus Falls	3	6	13	4
Granite Falls				
Hastings	1		1	
Hibbing	29	7	2	8
Hutchinson				
Jordon				1
Lake City	1			
Litchfield			3	
Little Falls	1	6	1	2
Luverne				
Le Sueur				
Madison				
Mankato		4	32	3
Marshall	2			2
Melrose			1	2
Minneapolis	87	71	53	66
Montgomery				
Montevideo				
Moorhead	7	5	2	3
Morris				
New Prague				
New Ulm		3		1
Northfield		2		
North Mankato				1
Ortonville				
Owatonna		1	1	1
Pipestone			1	1
Red Lake Falls		1	1	1
Red Wing	2	1	3	3
Redwood Falls				
Renville				
Rochester	2		3	
Rushford				
St. Charles				
St. Cloud	6	9	3	4
St. James				
St. Paul	41	35	27	39
St. Peter	6	5	7	8
Sauk Center	1		1	2
Shakopee	2			1
Sleepy Eye				
South St. Paul			1	
South Stillwater				
Stillwater	1	5	1	2
Thief River Falls	1			8
Tower				
Tracy				
Two Harbors	6	5	3	7
Virginia	12	1	4	12
Wabasha			1	2
Warren				5
Waseca			1	
Waterville			2	
West St. Paul				
Willmar		3	1	
Windom			2	1
Winona		2	3	1
Worthington				

TABLE NO. VIII

Number of Deaths from Typhoid Fever per 100,000 Population.

Year	Minnesota	Minneapolis	St. Paul	Duluth
1888	53.63	99.29	106.22	268.04
1889	45.76	70.85	77.64	153.55
1890	30.80	39.47	55.59	126.47
1891	39.23	59.35	47.76	201.93
1892	28.60	48.10	40.97	110.56
1893	38.37	82.91	41.52	135.65
1894	35.18	56.14	25.49	170.61
1895	35.99	46.81	27.68	234.99
1896	27.81	35.73	28.45	249.29
1897	25.66	82.02	16.16	91.70
1898	22.49	45.63	29.29	69.40
1899	17.86	38.21	20.00	43.15
1900	32.60	38.97	23.93	117.07
1901	25.92	61.54	14.14	63.41
1902	21.21	28.75	13.58	55.41
1903	19.88	42.47	9.81	66.49
1904	18.68	41.20	14.18	62.35
1905	14.47	21.00	10.15	49.27
1906	21.29	31.77	20.12	47.52
1907	16.90	24.51	12.61	41.59
1908	17.48	18.82	13.21	68.26
1909	18.13	22.64	18.61	60.84

TABLE NO. IX.

Number of Deaths from Typhoid Fever per 100,000 of Population.

Area	Annual Average: 1901 to 1905	1902	1903	1904	1905	1906
Cleveland, Ohio	49.9	35.5	115.0	49.6	14.9	20.2
Buffalo, N. Y	28.9	33.7	34.6	24.2	24.4	23.6
San Francisco, Cal	27.0	29.6	25.0	31.4	23.9	*
Cincinnati, Ohio	56.1	61.9	42.7	80.2	41.1	71.5
Pittsburg, Pa	129.6	140.6	136.5	139.4	107.9	141.3
New Orleans, La	40.9	44.2	40.9	36.7	32.6	29.6
Detroit, Mich	20.3	23.5	20.0	17.6	21.2	22.3
Milwaukee, Wis	18.1	15.1	16.8	13.6	22.7	30.5
Washington, D. C	56.6	79.1	48.8	47.0	48.2	52.3
Newark, N. J	18.7	19.6	22.9	13.6	14.1	17.6
Jersey City, N. J	18.0	20.3	14.9	18.9	19.8	20.2
Louisville, Ky	55.6	60.3	59.8	61.6	49.4	67.7
Minneapolis, Minn	37.8	26.9	41.1	40.4	24.4	32.9
Providence, R. I	20.1	21.1	19.5	15.5	20.1	19.2
Indianapolis, Ind	45.6	44.5	51.1	68.4	30.2	39.2
Kansas City, Mo	53.7	38.2	80.3	43.1	61.4	37.8
St. Paul, Minn	12.5	13.6	10.4	13.7	10.7	21.1
Rochester, N. Y	13.8	11.8	12.1	15.8	11.5	17.2
Denver, Colo	46.6	60.6	55.7	30.3	40.6	68.5
Toledo, Ohio	36.3	34.7	29.5	37.2	45.7	45.0
Allegheny, Pa	110.1	121.6	102.9	123.2	126.7	136.3
Columbus, Ohio	72.3	37.1	37.6	147.7	85.1	37.1

*Population not estimated.

TABLE NO. X.

Number of Deaths from Typhoid Fever per 100,000 of Population.

Country	Annual Average: 1901 to 1905	1902	1903	1904	1905
U. S. (registration area)...	32.2	32.4	34.3	31.9	28.1
Australasia..............	19.0	20.5	25.5	15.5	13.7
Austria.................	20.1	18.1	19.7	*	*
Belgium.................	17.6	17.8	15.6	14.9	*
Ceylon..................	142.0	150.9	141.6	125.8	154.4
Finland.................	155.1	162.1	137.8	148.1	*
German Empire...........	7.6	7.0	7.3	7.0	*
Hungary.................	28.3	27.0	28.1	25.4	32.2
Italy...................	35.0	34.6	35.3	36.7	32.4
Jamaica.................	11.5	12.3	11.2	16.3	8.5
Japan...................	11.4	11.4	9.8	*	*
Norway..................	5.7	4.5	6.4	4.4	*
Roumania................	12.6	10.1	14.5	12.7	14.3
Servia..................	67.5	84.6	70.0	73.5	16.2
Spain...................	46.3	45.8	43.4	44.5	*
Sweden..................	9.2	10.4	4.7	*	*
Switzerland.............	6.5	6.0	5.0	7.7	*
England and Wales.......	11.2	12.6	10.0	9.3	8.9
Scotland................	12.2	12.2	12.1	8.9	*
Ireland.................	13.1	14.0	10.9	10.6	11.4

*No figures available; average only for years shown.

There were 370 deaths from this disease in Minnesota in 1908, and 393 deaths in 1909.

SMALLPOX.

Minnesota has no compulsory vaccination laws; hence smallpox still prevails. The Minnesota State Board of Health, realizing the hopelessness of all attempts to control smallpox without vaccination, and also realizing the mistakes so commonly made of trying to protect the people by quarantine without vaccination, determined to throw the responsibility of protection by vaccination upon the public. It therefore published the following resolution in 1907:

> It having been established that smallpox will not occur in a well vaccinated community, and that all attempts to restrain this disease in a community not protected by vaccination, by means of quarantine, will fail; that quarantine in a well-vaccinated community is unnecessary; that attempts to control the spread of smallpox by means of quarantine are unscientific, irrational, expensive and misleading; that, in laying down strict rules for the quarantine of smallpox, sanitary authorities are favoring unscientific and illogical methods for its control and are conveying false ideas as to the safety of the public, the Minnesota State Board of Health advises that after January 1, 1908, further attempts to control smallpox by means of quarantine shall be abandoned.

And put the following regulations into force Jan. 1, 1908:

> 11. The local health officer having knowledge of, or having reason to suspect, the existence of smallpox, shall investigate, and at once place upon the house where smallpox exists a sign setting forth the facts. This sign is to serve only as a warning to those who may wish to avoid the house, and not as an indication of quarantine. When the attending physician considers a smallpox patient as having recovered he shall report the fact in

writing to the local health officer, who shall thereupon remove the warning card from the house. The patient must not leave the house until after the removal of the warning card.

12. The apartments occupied by a smallpox patient shall be deemed infected, and when vacated by death, or removal of the patient shall, together with their contents, be thoroughly disinfected under the supervision of the local health officer.

13. Every physician shall immediately report to the local health officer, in writing, the name of every smallpox patient under his care, the state of his or her disease, and his or her place of residence. A report must be made for each case as it occurs in a family or household.

14. Every physician shall report, in writing, to the local health officer the death of any smallpox patient under his care within twelve (12) hours thereafter.

15. The local health officer of any city, village or township must report within twenty-four hours to the secretary of the Minnesota State Board of Health all cases of smallpox occurring within his jurisdiction, and the date of removal of the warning card.

(Note carefully Regulations 1 to 9, inclusive.)

VACCINATION.

16. Following an exposure of smallpox, every individual who cannot show evidence of a recent successful vaccination or a recent attack of smallpox must be vaccinated (within three (3) days of the first exposure) or placed under the same isolation restrictions as smallpox patients.

If smallpox prevails in a community, or if the disease appears in a school, all unvaccinated teachers and pupils must be excluded from school for a period of three weeks unless vaccinated within three (3) days of first exposure. Failing to comply with this requirement, the school must be closed for a period of three weeks.

If smallpox appears in any class in any college in Minnesota, all unvaccinated teachers and students in the class must be excluded from recitations for a period of three weeks unless vaccinated within three (3) days of first exposure. Failing to comply with this requirement, the classes attended by such teachers or students must be discontinued for a period of three weeks.

SMALLPOX DISINFECTION REGULATIONS.

17. All persons having been ill with smallpox must have their clothing disinfected and take a disinfecting bath before being released from quarantine.

An epidemic of smallpox, started in the fall of 1907 under the old regulations and quarantine methods, was in full force when the new regulations went into effect Jan. 1, 1908, and dire predictions were made upon the effect of these new regulations. But the Board had considered the matter carefully, and the wisdom of its action was sustained. When people found that they as individuals were to be responsible for protection or non-protection against this disease voluntary vaccination became quite general. The special privileges extended to the vaccinated, with the penalty upon the unvaccinated still further tended to encourage vaccination. The result was that even with the new regulations going into effect in the midst of a smallpox epidemic the disease declined. During previous years smallpox had prevailed in epidemic form each winter. It is interesting to note the course of the disease during the winter months during the past four years, as shown in the following table:

SMALLPOX CASES REPORTED DURING CERTAIN WEEKS.

1907-08	Cases.
Week ending Oct. 7	11
Week ending Oct. 14	6
Week ending Oct. 21	45
Week ending Oct. 28	59
Week ending Nov. 4	59
Week ending Nov. 11	92
Week ending Nov. 8	43
Week ending Nov. 25	57
Week ending Dec. 2	62
Week ending Dec. 9	81
Week ending Dec. 16	152
Week ending Dec. 23	170
Week ending Dec. 30	259
Week ending Jan. 6	217
Week ending Jan. 13	222
Fifteen weeks	1,535

1908-09	Cases.
Week ending Oct. 5	4
Week ending Oct. 12	8
Week ending Oct. 19	8
Week ending Oct. 26	14
Week ending Nov. 2	11
Week ending Nov. 9	17
Week ending Nov. 16	18
Week ending Nov. 23	25
Week ending Dec. 1	25
Week ending Dec. 8	67
Week ending Dec. 15	51
Week ending Dec. 22	82
Week ending Dec. 29	66
Week ending Jan. 5	33
Week ending Jan. 12	44
Fifteen weeks	473

1909-10	Cases.
Week ending Oct. 4	5
Week ending Oct. 2	2
Week ending Oct. 18	0
Week ending Oct. 25	3
Week ending Nov. 1	1
Week ending Nov. 8	14
Week ending Nov. 15	31
Week ending Nov. 22	76
Week ending Nov. 29	30
Week ending Dec. 6	15
Week ending Dec. 13	35
Week ending Dec. 20	14
Week ending Dec. 27	9
Week ending Jan. 3	18
Week ending Jan. 10	12
Fifteen weeks	265

1910-11	Cases.
Week ending Oct. 9	3
Week ending Oct. 16	0
Week ending Oct. 23	10
Week ending Oct. 30	10
Week ending Nov. 6	2
Week ending Nov. 13	1
Week ending Nov. 20	13
Week ending Nov. 27	10
Week ending Dec. 4	3
Week ending Dec. 11	49
Week ending Dec. 18	22
Week ending Dec. 25	6
Week ending Jan. 2	3
Week ending Jan. 9	29
Week ending Jan. 16	26
Fifteen weeks	184

The total deaths during these four years are as follows:

Year.	Cases.	Deaths.	Year.	Cases.	Deaths.
1907	2,787	10	1909	1,238	17
1908	6,215	31	1910	1,047	7

The death rate is remarkably low, less than a half of 1 per cent. This mild type of the disease has prevailed ever since the present outbreak began in 1897. It is interesting to note the group of individuals most likely to die, as shown by the following:

AGES OF THOSE DYING OF SMALLPOX IN 1908.

Stillborn	3	2 to 6 years	4
A few hours only	8	20 to 40 years	9
Two months	1	60 to 80 years	3
1 to 2 years	3		

Pregnant women are more liable to die than other patients. As a rule, miscarriages or premature labor is a sequel of the disease, and the child born of a smallpox mother is generally dead at birth, or dies soon after birth. Among the total death records given above, three were stillborn children of mothers ill with smallpox at the time of confinement, and eight were children only a few hours old.

The statistics for smallpox in Minnesota during 1908 and 1909 are as follows:

TABLE NO. XI—

COUNTY	Total	Sex		Color			Date of Death											
		Male	Female	White	Black	Other Color	January	February	March	April	May	June	July	August	September	October	November	December
Becker	2	1	1	2	....	....	....	....	1	....	....	1	....	....	....	....	....	....
Blue Earth	1	1	....	1	....	....	....	....	1	....	....	....	....	....	....	....	....	....
Brown	1	1	....	1	....	....	....	....	1	....	....	....	....	....	....	....	....	....
New Ulm	**1**	**1**	....	**1**	....	....	....	....	**1**	....	....	....	....	....	....	....	....	....
Hubbard	2	2	....	2	....	....	....	1	....	....	1	....	....	....	....	....	....	....
Le Sueur	1	....	1	1	....	....	....	....	....	1	....	....	....	....	....	....	....	....
McLeod	1	....	1	1	....	....	....	....	....	....	....	1	....	....	....	....	....	....
Morrison	1	....	1	1	....	....	1	....	....	....	....	....	....	....	....	....	....	....
Little Falls	**1**	....	**1**	**1**	....	....	**1**	....	....	....	....	....	....	....	....	....	....	....
Otter Tail	1	....	1	1	....	....	....	....	1	....	....	....	....	....	....	....	....	....
Steele	1	1	....	1	....	....	....	....	....	....	....	1	....	....	....	....	....	....
Todd	1	1	....	1	....	....	....	....	....	1	....	....	....	....	....	....	....	....
Wadena	1	1	....	1	....	....	....	....	....	....	....	....	1	....	....	....	....	....
Waseca	1	1	....	1	....	....	....	1	....	....	....	....	....	....	....	....	....	....
Washington	1	....	1	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Stillwater	**1**	....	**1**	**1**	....	....	....	....	....	....	....	....	....	....	....	....	....	**1**
Winona Co.	2	1	1	2	....	....	1	....	....	....	....	....	....	....	....	....	1	....
Total	17	10	7	17	....	....	2	2	4	2	1	3	1	....	....	....	1	1

Note: Figures for cities over 5,000 population are printed in heavy faced type, but the same figures are included in the county line preceding.

SMALLPOX, 1909

Age												Conjugal Condition				Birth Place			
Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Wid.or Div.	Not Given	Minnesota	Other U. S.	Foreign	Not Given
....	....	....	1	....	1	....	....	....	....	....	....	2	....	....	......	2	......	......	......
1	....	....	....	....	....	....	....	....	....	....	....	1	....	....	......	1	......	......	......
1	....	....	....	....	....	....	....	....	....	....	....	1	....	....	......	1	......	......	......
1	....	....	....	....	....	....	....	....	....	....	....	1	....	....	......	1	......	......	......
1	....	....	....	....	....	....	....	1	....	....	....	2	....	....	......	1	1	......	......
1	....	....	....	....	....	....	....	....	....	....	....	1	....	....	......	1	......	......	......
1	....	....	....	....	....	....	....	....	....	....	....	1	....	....	......	1	......	......	......
1	....	....	....	....	....	....	....	....	....	....	....	1	....	....	......	1	......	......	......
1	....	....	....	....	....	....	....	....	....	....	....	1	....	....	......	1	......	......	......
....	....	....	....	....	....	....	1	....	....	....	....	....	1	....	......	1	......	......	......
1	....	....	....	....	....	....	....	....	....	....	....	1	....	....	......	1	......	......	......
....	....	....	....	....	....	....	1	....	....	....	....	....	1	....	......	......	1	......	......
....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	......	1	......	......	......
....	....	....	....	....	1	....	....	....	....	....	....	1	....	....	......	1	......	......	......
1	....	....	....	....	....	....	....	....	....	....	....	1	....	....	......	1	......	......	......
1	....	....	1	....	....	....	....	....	....	....	....	1	....	....	......	1	......	......	......
1	....	....	....	....	....	1	....	....	....	....	....	1	1	....	......	1	1	......	......
9	....	....	2	....	2	1	2	1	....	....	....	14	3	....	......	14	3	......	......

TABLE No. XII

Cases of Smallpox Reported in Minnesota During 1908

MONTH	Total	Sex			Age								Reported by		
		Male	Fe-male	Not Given	Under 1	1 to 5	5 to 10	10 to 20	20 to 50	50 to 70	Over 70	Not Given	H. O.	Phy-sician	Others
January	955	545	342	68	9	47	106	255	385	25	4	124	847	36	72
February	977	446	445	86	14	78	134	277	445	22	5	91	891	16	70
March	1,174	608	461	105	22	81	142	314	592	42	4	77	1,166	7	1
April	1,129	608	491	80	6	69	156	317	462	33	3	82	1,114	10	5
May	784	391	334	59	13	55	109	211	302	21	1	72	782	....	2
June	363	200	152	11	7	35	62	104	122	12	....	21	363	....	....
July	243	118	99	26	7	14	40	73	77	6	2	4	243	....	....
August	112	54	47	11	1	11	24	29	30	5	....	12	112	....	....
September	39	15	22	2	....	5	12	7	12	....	....	3	39	....	....
October	67	29	32	6	2	5	13	22	21	2	....	2	67	....	....
November	142	77	57	8	1	13	31	42	43	2	....	10	142	....	....
December	230	121	97	12	1	18	31	60	93	7	3	17	230	....	....
Totals	6,215	3,212	2,579	474	83	431	860	1,711	2,584	177	22	515	5,996	69	150

TABLE No. XII—Continued

Cases of Smallpox Reported in Minnesota During 1908

MONTH	Vaccination							Source of Infection							Result	
	No	Never Successful	In Childhood	5 or more yrs.preceding	Not Given	Doubtful	Yes	Same Family	Neighbor	School	Other Town	Unknown	Not Given	Other Sources	Recovered	Died
January...........	664	4	35	10	226	8	8	132	112	15	82	278	311	....	951	4
February..........	705	23	48	2	159	27	13	102	65	30	47	309	334	90	969	8
March.............	811	26	61	24	228	7	17	148	211	19	55	332	363	46	1,170	4
April..............	750	12	60	25	268	2	12	138	148	29	34	308	460	12	1,126	3
May...............	542	10	37	11	178	1	5	107	131	23	23	214	274	12	784	5
June..............	251	3	22	11	72	....	4	29	80	24	18	94	114	4	363	....
July...............	127	11	14	4	86	....	1	51	27	1	34	64	89	7	242	1
August............	71	1	11	....	27	....	2	11	4	....	6	22	41	28	111	1
September.........	28	....	3	1	7	....	....	9	3	....	2	7	17	1	39	....
October...........	55	1	3	1	6	....	1	1	4	2	1	34	25	....	66	1
November.........	99	1	14	2	25	....	1	3	13	31	3	48	43	1	142	....
December.........	183	2	12	2	31	....	....	39	33	13	12	73	57	3	226	4
Totals.........	4,286	94	320	93	1,313	45	*64	770	831	187	317	1,783	2,128	204	6,199	31

*Vaccinated in 1903, 18. In 1904, 9. In 1905, 4. In 1906, 2. In 1907, 1. In 1908, 6. Year not given, 24.

TABLE No. XIII

Cases of Smallpox Reported in Minnesota During 1909

MONTH	Total	Sex			Age								Reported by		
		Male	Fe-male	Not Given	Under 1	1 to 5	5 to 10	10 to 20	20 to 50	50 to 70	Over 70	Not Given	H. O.	Phy-sician	Others
January	235	134	99	2	4	18	24	68	100	8	2	11	231	4	......
February	241	131	104	6	4	14	21	72	110	8	1	11	221	5	15
March	186	8	69	109	3	17	20	55	75	7	9	......	184	2	......
April	121	87	32	2	1	6	12	26	56	3	1	16	119	2	......
May	122	75	46	1	......	11	33	35	34	2	......	7	113	9	......
June	59	30	26	3	3	3	10	22	17	2	......	2	59	......	......
July	25	16	9	......	......	3	......	9	11	......	1	1	25	......	......
August	2	2	......	......	......	......	......	......	1	......	......	1	2	......	......
September	11	7	4	......	1	1	......	2	6	......	......	1	11	......	......
October	37	18	18	1	......	1	6	14	14	......	......	2	37	......	......
November	141	77	59	5	......	3	24	44	62	3	......	5	140	1	......
December	58	38	20	......	......	1	16	9	31	......	......	1	58	......	......
Totals	1,238	623	486	129	16	78	166	356	517	33	14	58	1,200	23	15

TABLE No. XIII—Continued

Cases of Smallpox Reported in Minnesota During 1909

MONTH	Vaccination							Source of Infection							Result	
	No	Never Successful	In Childhood	5 or more yrs. preceding	Not Given	Doubtful	Yes	Same Family	Neighbor	School	Adj. Town	Unknown	Not Given	Other Sources	Recovered	Died
January...........	150	3	20	50	1	....	12	33	21	10	9	63	13	86	234	2
February..........	152	5	13	66	....	....	5	21	21	2	6	71	12	108	239	2
March............	112	1	21	47	....	....	5	22	20	....	1	55	5	83	182	4
April.............	65	2	13	36	....	....	5	8	18	1	5	46	10	33	119	2
May..............	85	....	5	31	....	....	1	9	31	10	2	27	5	38	122	1
June..............	43	2	3	10	....	....	1	8	13	....	6	15	3	14	56	3
July..............	10	....	2	13	....	....	....	5	6	....	2	3	3	6	24	1
August...........	1	....	....	1	....	....	....	....	....	....	1	....	....	1	2	....
September.........	10	....	1	....	....	....	....	1	1	....	....	4	....	5	11	....
October...........	27	1	3	6	....	....	....	5	6	9	1	10	1	5	37	....
November.........	93	....	9	38	1	....	....	7	21	41	7	23	4	38	140	1
December.........	52	....	2	4	....	....	....	2	7	3	14	20	4	8	58	1
Totals.........	800	14	92	3082	2	....	*29	121	165	76	54	337	60	425	1,224	17

*Vaccinated in 1905 10. Vaccinated in 1907, 3. Vaccinated in 1908, 5. Vaccinated in 1909, 2. Year not given, 8.

SCARLET FEVER.

This is one of the most difficult diseases to control that come under the supervision of sanitary authorities. We do not know its cause, nor have we a means of control such as vaccination against smallpox. However, we do know that in all probability one of the chief dangers in spreading this disease is to be found in the infectious discharges from the nose, throat and ears of convalesing patients. It is now well known that with reasonable care in hospitals there need be no "contact" cases. At the same time it is well known that it is almost impossible to care for the diseased one at home without "contact" cases, especially if there are other children in the household. Economy would seem to point to the need of properly equipped isolation hospitals for the care of patients suffering from this disease, and these hospitals are quite as important for the country districts as for the cities. It would be far better if the farmer were in a position to remove **the first case** of scarlet fever in his home to an isolation hospital, the mother accompanying the child if necessary. By such a procedure it should be possible in many instances to avoid the appearance of "contact" cases in the home, and, further, it would do away with the financial loss which is often a serious burden on the farmer because of the necessary exclusion of dairy products (milk, cream and butter) during the time his home is in quarantine on account of scarlet fever. Still further, the demoralization so common, of attendance upon schools in a district where scarlet fever prevails, would be done away with were isolation hospitals in general use.

The deaths in Minnesota from scarlet fever in 1908 and 1909 were 117 and 244, respectively. These indicate a large number of cases, for the death rate in Minnesota is estimated at 5 per cent among those affected. This would give totals of about 2,223 and 4,636, respectively, for the two years. These cases undoubtedly caused a financial loss, the amount of which would have gone a long way toward maintaining isolation hospitals, and this loss has fallen largely upon individuals who could ill afford it.

The statistics of deaths for scarlet fever in Minnesota during 1909 are shown in the following table:

TABLE No. XIV—

COUNTY	Total	Sex		Color			Date of Death											
		Male	Female	White	Black	Other Color	January	February	March	April	May	June	July	August	September	October	November	December
Aitkin																		
Anoka	2	1	1	2						1						1		
Becker	3		3	3							1	2						
Beltrami	3	2	1	3								1	1					1
Benton																		
Big Stone	2	1	1	2			1			1								
Blue Earth	2	2		2						2								
Mankato																		
Brown	2		2	2							2							
New Ulm																		
Carlton	3	2	1	3					1		1	1						
Cloquet																		
Carver																		
Cass	1	1		1					1									
Chippewa	2	1	1	2			1					1						
Chisago																		
Clay	3	2	1	3				1	2									
Clearwater	1	1		1			1											
Cook																		
Cottonwood																		
Crow Wing	1	1		1								1						
Brainerd	**1**	**1**		**1**								**1**						
Dakota	9	6	3	9			1		1	1						3	3	
Dodge	1		1	1			1											
Douglas																		
Faribault																		
Fillmore	1	1		1				1										
Freeborn																		
Albert Lea																		
Goodhue	2		2	2						1							1	
Red Wing																		
Grant																		
Hennepin	38	22	16	38			5	2	5	8	5	2	e	1			1	6
Minneapolis	**31**	**18**	**13**	**31**			**3**		**4**	**7**	**4**	**2**	**3**	**1**			**1**	**6**
Houston																		
Hubbard	6	4	2	6								1	1		3	1		
Isanti																		
Itasca	3	1	2	3				1		1			1					
Jackson																		
Kanabec																		
Kandiyohi	1	1		1						1								
Kittson	4	2	2	4				3	1									
Koochiching																		
Lac Qui Parle																		
Lake	3	2	1	3					1		2							
Le Sueur																		
Lincoln	1	1		1						z1								
Lyon																		
McLeod	1		1	1					1									
Mahnomen																		
Marshall																		
Martin																		
Meeker	1	1		1						1								
Mille Lacs																		
Morrison																		
Little Falls																		
Mower																		
Austin																		
Murray																		
Nicollet	1		1	1								1						
St. Peter	**1**		**1**	**1**								**1**						
Nobles																		
Norman																		
Olmsted	1		1	1														1
Rochester																		
Otter Tail	3	2	1	3					1	2								
Fergus Falls																		
Pine	4	1	3	4					1	2						1		
Pipestone																		
Polk	12	6	6	12					4	1	3	1					3	

SCARLET FEVER, 1909

Age													Conjugal Condition				Birth Place			
Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Ov	Not	Si	M	Wid.or Div.	Not Given	Minnesota	Other U. S.	Foreign	Not Given
	1			1									2					1	1	
		2		1									3				3			
		3											3				3			
		1		1									2				2			
				2									2				2			
		1	1										2				2			
1	1			1									3				3			
					1								1				1			
		1		1									2				2			
		2	1										3				3			
		1											1				1			
		1											1				1			
		1											**1**				**1**			
	1	1	4	2	1								9				8	1		
1													1				1			
1													1				1			
		2											2				2			
1	6	14	12	3	1	1							38				28	9	1	
1	**5**	**10**	**10**	**3**	**1**	**1**							**31**				**21**	**9**	**1**	
3	3												6				4	1	1	
	1	1				1							2	1			2	1		
	1												1				1			
1		1	2										4				4			
		3											3				2		1	
			1										1				1			
	1												1				1			
				1									1				1			
		1											1				1			
		1											**1**				**1**			
					1									1			1			
			2		1								2	1			1	2		
	1	1		1	1								3	1			3	1		
	1	4	4	3									12				10	2		

TABLE No. XIV—SCARLET

COUNTY	Total	Sex		Color			Time of Death											
		Male	Female	White	Black	Other Color	January	February	March	April	May	June	July	August	September	October	November	December
Crookston	**4**	**3**	**1**	**4**	....	....	....	....	....	**1**	**3**	....	....	....	....	....	....	....
Pope	1	1	....	1	....	....	....	....	....	....	....	....	....	1	....	....	....	....
Ramsey	68	29	39	68	....	....	6	7	7	11	18	6	5	1	....	3	4	....
St. Paul	**67**	**28**	**39**	**67**	....	....	**6**	**7**	**7**	**11**	**18**	**5**	**5**	**1**	....	**3**	**4**	....
Red Lake	1	1	....	1	....	....	....	....	....	1	....	....	....	....	....	....	....	....
Redwood	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Renville	2	1	1	2	....	....	....	1	....	....	....	....	....	....	....	....	....	1
Rice	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Faribault	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Rock	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Roseau	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
St. Louis	44	28	16	44	....	....	1	2	3	6	7	9	7	8	....	....	....	1
Duluth	**21**	**11**	**10**	**21**	....	....	**1**	**2**	**2**	**2**	**4**	**6**	**2**	**1**	....	....	....	**1**
Eveleth	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Hibbing	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Virginia	**3**	**1**	**2**	**3**	....	....	....	....	....	**3**	....	....	....	....	....	....	....	....
Scott	2	1	1	2	....	....	....	....	....	....	....	....	1	....	....	....	....	1
Sherburne	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Sibley	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Stearns	1	....	1	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
St. Cloud	**1**	....	**1**	**1**	....	....	....	....	....	....	....	....	....	....	....	....	....	**1**
Steele	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Owatonna	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Stevens	2	1	1	2	....	....	....	....	....	1	....	....	....	....	....	1	....	....
Swift	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Todd	1	....	1	1	....	....	....	....	....	....	1	....	....	....	....	....	....	....
Traverse	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Wabasha	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Wadena	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Waseca	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Washington	2	1	1	2	....	....	....	....	1	....	1	....	....	....	....	....	....	....
Stillwater	**1**	**1**	....	**1**	....	....	....	....	....	....	**1**	....	....	....	....	....	....	....
Watonwan	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Wilkin	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Winona	3	1	2	3	....	....	....	....	....	....	....	2	....	....	....	....	1	....
Winona	**3**	**1**	**2**	**3**	....	....	....	....	....	....	....	**2**	....	....	....	....	**1**	....
Wright	1	....	1	1	....	....	....	....	....	....	1	....	....	....	....	....	....	....
Yellow Medicine	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Total	245	128	117	245	....	....	17	18	30	42	42	28	19	11	3	10	13	12

Note: Figures for cities over 5,000 population are printed in heavy faced type, but the same figures are included in the county line preceding.

EVER, 1909—Continued

Age													Conjugal Condition				Birth Place			
Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Not given	Single	Married	Wid. or Div.	Not Given	Minnesota	Other U. S.	Foreign	Not Given
....	....	**1**	**2**	**1**	....	....	....	....	....	....	....	....	**4**	....	....	....	**4**	....	....	....
....	....	1	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....
2	8	17	12	6	7	2	....	....	....	....	....	....	64	4	....	....	26	39	3	....
2	**8**	**16**	**26**	**5**	**7**	**2**	....	....	....	....	....	....	**63**	**4**	....	....	**25**	**39**	**3**	....
....	....	....	....	1	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	1	1	....	....	....	....	....	....	....	....	....	....	2	....	....	....	2	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
4	4	17	13	4	2	....	....	....	....	....	....	....	43	1	....	....	29	9	6	....
1	**1**	**7**	**7**	**3**	**2**	....	....	....	....	....	....	....	**20**	**1**	....	....	**10**	**6**	**5**	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	**2**	....	**1**	....	....	....	....	....	....	....	....	....	**3**	....	....	....	**3**	....	....	....
....	2	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	2	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
1	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....
1	....	....	....	....	....	....	....	....	....	....	....	....	**1**	....	....	....	**1**	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	1	....	1	....	....	....	....	....	....	....	....	2	....	....	....	2	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	1	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	1	....	1	....	....	....	....	....	....	....	....	....	2	....	....	....	2	....	....	....
....	**1**	....	....	....	....	....	....	....	....	....	....	....	**1**	....	....	....	**1**	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	1	2	....	....	....	....	....	....	....	....	....	....	3	....	....	....	3	....	....	....
....	**1**	**2**	....	....	....	....	....	....	....	....	....	....	**3**	....	....	....	**3**	....	....	....
....	1	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
15	35	79	67	30	15	4	....	....	....	....	....	....	236	9	....	....	167	66	12	......

MEASLES.

This disease is generally looked upon as mild and deserving of little attention. This is a mistake. Many deaths due in fact to this disease are charged against diseases of the respiratory tract, owing to incomplete death returns. The deaths from measles have fortunately been quite low during the years 1908 and 1909, the record showing only 87 and 30, respectively. The statistics of deaths from measles for 1909 are given in the following table:

TABLE No. XV—

COUNTY	Total	Sex		Color			Date of Death											
		Male	Female	White	Black	Other Color	January	February	March	April	May	June	July	August	September	October	November	December
Benton	1		1	1														1
Brown	1	1		1									1					
Clearwater	1	1		1									1					
Fillmore	1	1		1													1	
Goodhue	1	1		1										1				
Hennepin	1		1	1					1									
Minneapolis	**1**		**1**	**1**					**1**									
Isanti	1		1	1					1									
Itasca	1	1		1									1					
Kandiyohi	1	1		1					1									
Lac qui Parle	6	1	5	6						1	2	1	2					
Martin	1	1		1										1				
Mille Lacs	1	1		1					1									
Ramsey	1	1		1														1
St. Paul	**1**	**1**		**1**														**1**
Redwood	2	1	1	2								2						
Rock	1	1		1						1								
St. Louis	6	4	2	6						1	2						2	1
Duluth	**3**	**2**	**1**	**3**							**2**						**1**	
Watonwan	1		1	1								1						
Wright	2	1	1	2				1		1								
Total	30	17	13	30				1	4	4	4	4	5	2			3	3

Note: Figures for cities over 5,000 population are printed in heavy faced type, but the same figures are included in the county line preceding.

MEASLES, 1909

Age													Conjugal Condition				Birth Place			
Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Not Given	Single	Married	Wid. or Div.	Not Given	Minnesota	Other U. S.	Foreign	Not Given
1	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	......	......	......
1	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	......	......	......
....	1	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	......	......	......
....	1	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	......	......	......
....	....	....	1	....	....	....	....	....	....	....	....	....	1	....	....	....	1	......	......	......
....	....	....	....	1	....	....	....	....	....	....	....	....	1	....	....	....	1	......	......	......
....	....	....	....	1	....	....	....	....	....	....	....	....	1	....	....	....	1	......	......	......
....	....	1	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	......	1	......
....	....	....	....	1	....	....	....	....	....	....	....	....	1	....	....	....	1	......	......	......
1	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	......	......	......
2	2	1	....	....	....	1	....	....	....	....	....	....	5	1	....	....	5	......	1	......
....	....	....	....	1	....	....	....	....	....	....	....	....	1	....	....	....	1	......	......	......
....	....	1	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	1	......	......
....	....	....	1	....	....	....	....	....	....	....	....	....	1	....	....	....	....	......	1	......
....	....	....	1	....	....	....	....	....	....	....	....	....	1	....	....	....	....	......	1	......
....	1	1	....	....	....	....	....	....	....	....	....	....	2	....	....	....	2	......	......	......
1	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	......	......	......
2	....	2	1	....	1	....	....	....	....	....	....	....	6	....	....	....	4	1	1	......
1	....	....	1	....	1	....	....	....	....	....	....	....	3	....	....	....	2	......	1	......
1	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	......	......	......
2	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	2	......	......	......
11	5	6	3	3	1	1	....	....	....	....	....	....	29	1	....	....	24	2	4	......

PNEUMONIA.

The statistics for this disease are most unreliable. Too often the form of pneumonia is not given on the death certificate. Too often the disease is charged up with a death following an operation. Too often the cause of death is simply guessed at, and pneumonia comes in for its share of "loading" with these. The deaths charged against this group of diseases for 1908 number 1,877; for 1909, 1,756. As these are but little above the total for 1907, it would appear that the death rate for this disease was not on the increase, for the increase in deaths has not kept pace with the increase in population. On the other hand, the apparent fall in the number of deaths in 1909 may be due to the fact that in the recording of deaths charged against pneumonia an immense amount of correspondence has been carried on with reporting physicians in an attempt to clear up doubtful returns. This correspondence often calls forth sarcastic and critical replies from physicians, but these same men should remember that they are the bookkeepers for vital statistics in Minnesota, and they should not load up one account with debits that belong in some other part of the ledger.

The deaths among those who suffer from pneumonia in Minnesota are estimated at 12 per cent.

The statistics of deaths from pneumonia for 1909 are given in the following tables:

TABLE No. XVI—PNEUMONIA—

COUNTY	Total	Sex		Color			Date of Death											
		Male	Female	White	Black	Other Color	January	February	March	April	May	June	July	August	September	October	November	December
Aitkin	3	1	2	3			1					2						
Anoka	7	3	4	7				1		2	1			1			1	1
Becker	3	2	1	3					1		1					1		
Beltrami	13	7	6	13			1	4	2	3	1			1			1	
Benton																		
Big Stone	7	4	3	7					2	2	1						1	1
Blue Earth	10	1	9	10			1	2	1	2	1	1				1	1	
Mankato	**2**		**2**		**2**			**1**			**1**							
Brown	7	4	3	7				1	2		1		1		1			1
New Ulm	**1**	**1**		**1**					**1**									
Carlton	5	3	2	5					1		2				1	1		
Cloquet	**2**	**2**		**2**					**1**							**1**		
Carver	6	4	2	6				1	1	2				1			1	
Cass	3	1	2	3				1		1							1	
Chippewa	15	9	6	15			2		3	3	5					1		1
Chisago	15	9	6	15				2	1	1	4					3		4
Clay	10	3	7	10			1	1	1	4	2					1		
Clearwater																		
Cook																		
Cottonwood	6	3	3	6			1	1		1	1							2
Crow Wing	10	8	2	10						2	3	1			2	1		1
Brainerd	**6**	**5**	**1**	**6**						**1**	**2**				**1**	**1**		**1**
Dakota	13	6	7	13					3	4	2		1		1		1	1
Dodge	6	3	3	6			3		1	1			1					
Douglas	2		2	2							1							1
Faribault	10	2	8	10			1	1	3	1	1				2		1	
Fillmore	8	3	5	8			1		1	2	2						1	1
Freeborn	14	8	6	14			1	1	2	2	2		2	1			2	1
Albert Lea	**3**	**3**		**3**					**2**									**1**
Goodhue	6	3	3	6				2	1	2								1
Red Wing	**2**		**2**	**2**					**1**	**1**								
Grant	4	1	3	4			2		1								1	
Hennepin	177	101	76	175	2		21	22	25	23	12	9	9	2	6	13	14	21
Minneapolis	**165**	**95**	**70**	**163**	**2**		**20**	**21**	**22**	**22**	**11**	**8**	**8**	**2**	**6**	**10**	**14**	**21**
Houston	3	2	1	3			1		2									
Hubbard																		
Isanti	11	6	5	11			1	1	2	1	2			1			1	2
Itasca	8	7	1	8			3		2	1	2							
Jackson	5		5	5			1		2	1			1					
Kanabec	9	8	1	9				1		3	1					2		2
Kandiyohi	8	5	3	8			1		2	2	1		1	1				
Kittson	2	1	1	2				1			1							
Koochiching	4	2	2	4				1									2	1
Lac Qui Parle	5	3	2	5				1	1	1		1	1					
Lake	4	2	2	4			1	1					1					1
Le Sueur	10	6	4	10			1	2	3							2	1	1
Lincoln	1		1	1								1						
Lyon	7	5	2	7				3		2				1		1		
McLeod	2	1	1	2						1						1		
Mahnomen																		
Marshall	8	6	2	8			1	1	1	1	1				2		1	
Martin	3	2	1	3				1				1				1		
Meeker	4	2	2	4				1		2							1	
Mille Lacs	6	3	3	6			1	1		2						1	1	
Morrison	7	6	1	7			1	1	3	2								
Little Falls	**1**	**1**		**1**				**1**										
Mower	9	7	2	9			1		2	3	1				1			1
Austin	**1**	**1**		**1**											**1**			
Murray	8	4	4	8			1		4	1			1	1				
Nicollet	11	3	8	11			1		3	2	2	1	1					1
St. Peter	**4**		**4**	**4**					**2**		**1**							**1**
Nobles																		
Norman	5	3	2	5					2								3	
Olmsted	6	3	3	6			1	1		1							2	1
Rochester	**2**		**2**		**2**					**1**								**1**
Otter Tail	11	10	1	11			1	1		1	1				1	2		4
Fergus Falls	**6**	**5**	**1**	**6**			**1**				**1**				**1**	**1**		**2**
Pine	1		1	1			1											
Pipestone	2	1	1							1		1						
Polk	11	2	9	11				1	3	1		1	1		1	2	1	

LOBAR, 1909

Age													Conjugal Condition				Birth Place			
Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Not Given	Single	Married	Wid. or Div.	Not Given	Minnesota	Other U. S.	Foreign	Not Given
						2			1					3					3	
				1			2		1	2	1		2	3	1	1	2		4	1
1							2						1	2			2		1	
	1	1			3	2	3	1	1	1			4	8	1		3	5	5	
1				1		1			2	2			2	3	2		2	1	4	
2				2			1		1	2	2		5	3	2		4		6	
1							1						1	1			1		1	
		1					1		1	3	1		1	3	3		1		5	1
		1											1				1			
			1		1	2		1					2	3			1	1	3	
					1			1					1	1				1	1	
		1		1					1	3			3	3			2	1	3	
1					1				1				2	1			1	1		1
4		1				2	3	1	2	1	1		6	6	2	1	6	2	6	1
								4	3	7	1		1	10	4			3	12	
		1		2	4	1		1		1			6	3	1		6	1	3	
			1			2		1	2				2	4			2	2	2	
1	1	1				1		3	2	1			3	6	1		3	2	4	1
		1				1		2	1	1			1	4	1		1	2	2	1
1					1	2	1	3	2	2	1		2	9	2		4		9	
		1	1		1		1	1		1			3	3			3	2	1	
											1	1		2					2	
2	1	1				1	2	1	2				4	5	1		4	3	3	
1								1	2	2	2		2	2	4		1	1	6	
3		1	1	1		1	2	1	2		2		7	5	2		6	1	7	
1							1		1				2	1			1		2	
				1	1	1	1	1	1				2	2	2		3	2	1	
					1	1							1	1			1	1		
			1	2	1								4				2	1	1	
7	4	7	6	11	22	15	33	24	19	23	6		72	57	33	15	45	53	67	12
6	**4**	**6**	**6**	**9**	**22**	**15**	**31**	**23**	**16**	**23**	**4**		**67**	**54**	**30**	**14**	**40**	**50**	**63**	**12**
1		1									1		2		1		2	1		
2			1	2	1			1	2	1	1		6	2	3		5		6	
			1		1	3	1		2				4	1	1	2	2	1	2	3
					1		1	2		1				3	2			2	3	
	3	2	1		1		1				1		8	1			6		3	
1	1	1			3				2				5	3			4	2	2	
		1							1				1		1		1		1	
1	1					1	1						2	2			3	1		
2						1		1	1				2	3			2	1	2	
						1		2				1	1	2		1	1		3	
1				1	1	1		2	1	2	1		3	3	4		5	3	1	1
							1							1					1	
1					1		2		1	2			2	2	3		3		4	
								1		1				2					2	
	4	1	2						1			7	1			6	1	1		
1										2			1		2		1	1	1	
		1				1		1		1			2	2			2	1	1	
	1	1	1	1					2				4	2			3	1	2	
1				1				2	2	1			3	2	2		2	1	4	
										1					1				1	
2		1					1	1	1	3			4	3	2		4	3	2	
							1							1			1			
3					1		3			1			5	2	1		4	2	2	
1						2	2		2	3	1		3	2	6		3	2	6	
						1	1			2			1		3		1	1	2	
		2								2	1		2		3		2		3	
					2		1	1	1	1			2	1	1	2	2	1	2	1
							1	1							1	1			1	1
1	1		1		1		2	1	1	2		1	5	5	1		4	2	5	
							2	1	1	1		1	1	4	1			1	5	
				1									1				1			
	1				1								2				1	1		
	2	1	1		1		1	1	2	2			5	3	3		3	1	6	1

TABLE No. XVI—PNEUMONIA

COUNTY	Total	Sex		Color			Date of Death											
		Male	Female	White	Black	Other Color	January	February	March	April	May	June	July	August	September	October	November	December
Crookston	**4**	**1**	**3**	**4**	....	....	....	....	**1**	**1**	....	**1**	....	....	....	....	**1**	....
Pope	2	....	2	2	....	....	....	....	....	1	....	....	....	....	....	1	....	....
Ramsey	109	67	42	104	5	....	8	13	16	11	15	3	6	7	5	4	7	14
St. Paul	**106**	**65**	**41**	**101**	**6**	....	**8**	**13**	**15**	**11**	**14**	**3**	**6**	**7**	**5**	**3**	**7**	**14**
Red Lake	3	1	2	3	....	....	....	1	1	....	....	....	....	....	....	1	....	....
Redwood	8	5	3	8	....	....	....	1	2	2	....	1	....	....	....	....	1	1
Renville	2	1	1	2	....	....	....	....	1	1	....	....	....	....	....	....	....	....
Rice	16	9	7	16	....	....	4	5	1	1	3	....	1	....	....	1	....	....
Faribault	**8**	**4**	**4**	**8**	....	....	**4**	....	....	....	**2**	....	**1**	....	....	**1**	....	....
Rock	3	2	1	3	....	....	....	....	....	....	3	....	....	....	....	....	....	....
Roseau	1	....	1	1	....	....	....	1	....	....	....	....	....	....	....	....	....	....
St. Louis	106	69	37	105	1	....	10	10	8	12	24	5	3	4	5	5	8	12
Duluth	**38**	**36**	**22**	**57**	**1**	....	**7**	**6**	**4**	**8**	**10**	**4**	**1**	**2**	**3**	**2**	**4**	**7**
Eveleth	**6**	**4**	**2**	**6**	....	....	....	....	....	**1**	**3**	....	....	**1**	....	....	**1**	....
Hibbing	**11**	**8**	**3**	**11**	....	....	....	....	**2**	**1**	**4**	....	....	....	....	....	**1**	**3**
Virginia	**7**	**5**	**2**	**7**	....	....	....	**1**	....	....	**3**	....	**1**	....	....	**1**	....	**1**
Scott	4	2	2	4	....	....	....	....	....	....	1	....	....	....	....	1	....	2
Sherburne	1	1	....	1	....	....	....	....	1	....	....	....	....	....	....	....	....	....
Sibley	4	2	2	4	....	....	1	....	....	1	1	....	....	....	1	....	....	....
Stearns	13	5	8	13	....	....	2	1	2	1	2	1	1	1	....	....	1	1
St. Cloud	**5**	**2**	**3**	**5**	....	....	....	**1**	....	**1**	**1**	....	**1**	**1**	....	....	....	....
Steele	4	3	1	4	....	....	....	....	1	1	1	....	....	....	....	1	....	....
Owatonna	**1**	**1**	....	**1**	....	....	....	....	....	....	**1**	....	....	....	....	....	....	....
Stevens	4	4	....	4	....	....	....	....	1	....	1	....	....	....	....	....	1	1
Swift	4	2	2	4	....	....	....	....	1	1	2	....	....	....	....	....	....	....
Todd	6	2	4	6	....	....	....	3	....	....	....	1	....	....	....	....	1	1
Traverse	6	4	2	6	....	....	1	1	3	....	....	1	....	....	....	....	....	....
Wabasha	4	3	1	4	....	....	1	....	....	2	....	....	....	....	....	....	1	....
Wadena	1	....	1	1	....	....	....	1	....	....	....	....	....	....	....	....	....	....
Waseca	5	3	2	5	....	....	....	1	....	2	1	....	....	....	....	1	....	....
Washington	7	4	3	7	....	....	1	1	1	....	1	....	2	....	....	....	....	1
Stillwater	**5**	**3**	**2**	**5**	....	....	....	**1**	**1**	....	**1**	....	**2**	....	....	....	....	....
Watonwan	5	2	3	5	....	....	....	....	1	....	1	....	....	....	1	1	1	....
Wilkin	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Winona	17	9	8	17	....	....	....	3	....	2	3	2	....	1	....	4	1	1
Winona	**13**	**7**	**6**	**13**	....	....	....	**3**	....	**2**	**3**	**1**	....	**1**	....	**2**	....	**1**
Wright	8	5	3	8	....	....	....	1	....	....	1	2	1	....	1	....	2	....
Yellow Medicine	8	2	6	7	....	1	1	2	....	1	1	....	1	....	....	2	....	....
Total	882	496	386	873	7	2	83	104	124	126	116	34	36	24	29	58	62	86

Note: Figures for cities over 5,000 population are printed in heavy faced type, but the same figures are included in the county line preceding.

—LOBAR, 1909—Continued

Age													Conjugal Cond.				Birth Place			
Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Not Given	Single	Maried	Widowed or Divorced	Not Given	Minnesota	Other U.S.	Foreign	Not Given
....	....	....	....	....	1	....	1	....	1	1	....	....	1	1	2	....	....	......	3	1
....	....	....	....	....	....	....	....	....	....	1	1	....	....	2	....	....	....	......	2	......
7	3	10	1	4	12	10	17	14	13	13	5	....	43	48	16	2	18	44	45	2
7	3	9	1	4	12	10	16	14	13	13	4	....	42	47	15	2	17	44	43	2
1	....	....	....	....	....	1	....	....	1	....	....	....	1	2	....	....	1	1	1	......
1	....	....	1	....	....	....	1	1	1	2	1	....	2	5	1	....	2	2	4	......
....	....	2	....	....	....	....	....	....	....	....	....	....	2	....	....	....	2	......	......	......
....	....	....	....	2	....	2	1	4	3	4	....	....	5	10	1	....	1	4	11	......
....	....	....	....	2	....	1	....	....	2	3	....	....	3	5	....	....	1	......	7	......
....	....	1	1	....	....	....	....	1	....	....	....	....	2	1	....	....	2	......	1	......
....	....	....	....	....	....	....	....	1	....	....	....	....	....	1	....	....	....	1	......	......
9	6	6	2	3	20	16	19	15	7	3	....	....	54	39	9	4	26	15	61	4
3	4	2	2	1	7	7	12	12	6	2	....	....	23	24	8	3	12	11	32	3
2	....	....	....	....	1	....	2	1	....	....	....	....	2	4	....	....	2	1	3	......
....	....	....	....	1	9	1	....	....	....	....	....	....	8	3	....	....	....	1	9	1
1	1	....	....	....	1	....	2	....	1	1	....	....	4	2	1	....	2	......	5	......
....	....	....	....	....	1	....	1	....	1	1	....	....	....	2	2	....	2	......	2	......
....	....	....	....	....	....	....	1	....	....	....	....	....	1	....	....	....	1	......	......	......
....	....	....	....	....	2	....	....	1	....	....	1	....	2	2	....	....	....	3	1	......
....	....	....	1	2	....	2	2	3	1	1	1	....	4	8	1	....	4	1	7	1
....	....	....	....	....	....	....	1	1	1	1	1	....	1	4	....	....	1	......	3	......
....	1	....	....	....	....	....	1	1	....	1	....	....	1	3	....	....	1	......	3	......
....	1	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	......	......	......
....	....	....	....	....	....	....	2	1	....	1	....	....	1	2	1	....	1	2	2	......
1	1	....	....	....	1	1	....	....	....	....	....	....	....	3	1	....	....	1	3	......
....	....	1	....	1	....	1	1	2	....	....	....	....	4	2	....	....	2	2	2	......
....	....	....	1	....	1	....	2	1	....	1	....	....	1	4	1	....	1	2	3	......
....	....	....	....	....	....	....	1	1	1	1	....	....	....	4	....	....	1	1	2	......
....	....	....	....	....	....	....	....	1	....	....	....	....	....	1	....	....	....	......	......	1
....	....	....	....	1	....	....	1	1	....	....	2	....	1	2	2	....	1	......	4	......
1	....	....	....	1	....	1	1	2	1	....	....	....	2	4	....	1	3	......	2	2
....	....	....	....	1	....	1	....	2	1	....	....	....	1	3	....	1	2	......	1	2
....	....	....	....	....	....	1	....	1	1	1	1	....	....	2	3	....	....	2	3	......
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	......	......	......
....	....	....	....	....	3	3	1	1	3	2	4	....	3	10	4	....	4	5	8	......
....	....	....	....	....	2	3	....	1	3	1	3	....	2	8	3	....	3	4	6	......
1	....	....	....	....	....	....	....	....	4	2	1	....	1	5	2	....	1	3	4	......
....	....	....	....	1	....	1	2	1	....	1	2	....	3	3	2	....	2	1	4	1
63	28	51	25	45	91	82	122	113	104	112	43	3	351	359	143	9	250	200	398	34

TABLE No. XVII—PNEUMONIA—BRONCHO—1909

Includes Senile Pneumonia and Infantile Pneumonia Under 2 Years of Age, Unless Specified as Lobar

COUNTY		Sex		Color			Date of Death												Age							
	Total	Male	Fe-male	White	Black	Other Color	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Under One	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50
Aitkin	8	5	3	7	1		2		2	2		1				1			5				1			1
Anoka	7	4	3	7				1	2	1						2		1	3	1						
Becker	7	4	3	7				3	1								1	2	6					[illegible]		
Beltrami	13	6	7	13			3	4	1	1					1	2	1		7	4				1		
Benton	6	4	2	6			2			1		1						2	4	2						
Big Stone	1	1		1					1										1							
Blue Earth	13	7	6	13			1	4	2	4					2				3		1					
Mankato	**7**	**4**	**3**	**7**				**2**	**2**	**2**					**1**						**1**					
Brown	6	4	2	6			1		2	1			1				1		2		1			1	1	
New Ulm	**1**	**1**		**1**						**1**																
Carlton	9	7	2	9			3	1		1							2	2	7	1	1					
Cloquet	**5**	**3**	**2**	**5**			**1**	**1**			**1**						**2**		**4**	**1**						
Carver	5	3	2	5				1	1	3									1	1		1				
Cass	3	3		3			1		1	1									2	1						
Chippewa	3	2	1	3					1		2								2		1					
Chisago	2	1	1	2					1									1								
Clay	4	3	1	4						2		1	1						2					1		
Clearwater	3	2	1	3				2									1		1		1					
Cook																										
Cottonwood	4	1	3	4			1			1	1						1		4							
Crow Wing	1	1		1														1								
Brainerd	**1**	**1**		**1**														**1**								
Dakota	13	7	6	13			2	1	3	2	2	2	1						7	1	1		1		1	
Dodge	6	4	2	6			2	1	1	2									2				1			
Douglas	10	8	2	10			1	1	1	3	1		1	1	1				6	1	1	2				
Faribault	4	3	1	4			1	1	1							1			3			1				
Fillmore	12	9	3	12			3	1	1	2	1	1			1	1		1	5		1			1	1	1
Freeborn	4	3	1	4			1			2		1							2	1					1	
Alvert Lea	**1**		**1**	**1**			**1**																		**1**	
Goodhue	9	6	3	9			1		3	1	1						1	2	5	1	1					
Red Wing																										
Grant	6	4	2	6				2	3		1								4	1						1
Hennepin	168	81	87	167	1		20	22	34	17	15	7	4	7	6	13	12	11	79	15	16				3	2
Minneapolis	**154**	**73**	**81**	**153**	**1**		**16**	**20**	**33**	**15**	**13**	**6**	**4**	**7**	**6**	**13**	**12**	**9**	**72**	**15**	**16**				**3**	**2**
Houston	6	2	4	6					2	1							1	2	4						1	
Hubbard	3	2	1	3							1			1	1				1							
Isanti	13	7	6	13			1	2		5	1			1		1	1	1	3	3			2			

Note: Figures for cities over 5,000 population are printed in heavy faced type, but the same figures are included in the county line preceding.

TABLE No. XVII—PNEUMONIA—BRONCHO—1909—Continued

includes Senile Pneumonia and Infantile Pneumonia Under 2 Years of Age, Unless Specified as Lobar

COUNTY	Age					Conjugal Cond.				Birth Place			
	50 to 60	60 to 70	70 to 80	Over 80	Not Given	Single	Married	Wid. or Div'd	Not Given	Minn.	Other U. S.	Foreign	Not Given
Aitkin	1					6	2			6		2	
Anoka	1	1	1			4	2	1		4		3	
Becker				1		6		1		6		1	
Beltrami					1	12	1			13			
Benton						6				6			
Big Stone						1				1			
Blue Earth		2	3	4		5	4	4		4	3	6	
Mankato		**2**	**2**	**2**		**2**	**2**	**3**		**1**	**2**	**4**	
Brown		1				3	3			5		1	
New Ulm		**1**					**1**					**1**	
Carlton						9				9			
Cloquet						**5**				**5**			
Carver		1		1		3	2			3		2	
Cass						3				3			
Chippewa						3				3			
Chisago				2			1	1				2	
Clay				1		3	1			2	1	1	
Clearwater				1		2		1		2		1	
Cook													
Cottonwood						4				4			
Crow Wing			1				1					1	
Brainerd			**1**				**1**					**1**	
Dakota	1		1			11		2		11		2	
Dodge		1	1	1		3	3			3	1	2	
Douglas						10				8	2		
Faribault						4				4			
Fillmore		1	1	1		8	2	2		8	2	2	
Freeborn						3	1			3	1		
Albert Lea							**1**			**1**			
Goodhue		1	1			7	1	1		7		2	
Red Wing													
Grant						5	1			5		1	
Hennepin	6	14	13	20		115	19	29	5	102	22	43	1
Minneapolis	**6**	**13**	**12**	**15**		**108**	**16**	**26**	**4**	**95**	**21**	**37**	**1**
Houston				1		4	2			4	1	1	
Hubbard		1		1		1		2		1		2	
Isanti			2	3		8	2	3		8	1	4	

TABLE No. XVII—PNEUMONIA—BRONCHO—1909—Continued

Includes Senile Pneumonia and Infantile Pneumonia Under 2 Years of Age, Unless Specified as Lobar

COUNTY	Total	Sex		Color			Date of Death												Age							
		Male	Female	White	Black	Other Color	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Under One	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50
Itasca	5	3	2	5				2	1						1			1	2	2	1					
Jackson	9	5	4	9			2	2		2				1		2			4	1						
Kanabec	1		1	1						1																
Kandiyohi	5	2	3	5				1		2							1	1	2	1						
Kittson	5	3	2	5					2		1							2	3	1	1					
Koochiching	1		1	1					1										1							
Lac qui Parle	8	3	5	8			1		2	2	1						1	1	4	1	2					
Lake	2		2	2							1					1			1	1						
Le Sueur	9	6	3	9				2	4	1		1						1	6					1		
Lincoln	6	3	3	6				1		1	2							2	2	1	2					
Lyon	8	6	2	8				2	3	1	1					1			5				1	1		
McLeod	7	4	3	7				1		1	2	1	1				1		3		1				1	
Mahnomen	3	1	2	2		1	1			1							1		2		1					
Marshall	4	3	1	4				1	1			1						1	3							
Martin	1		1	1				1																		
Meeker	7	4	3	7			2	2	1									2	3	1						
Mille Lacs																										
Morrison	7	4	3	7			1	1		1	1	1	1			1			5			1				
Little Falls																										
Mower	6	1	5	6					1	3	2										1	1				
Austin	3	1	2	3					1	1	1										1					
Murray	7	3	4	7				2		2		1					1	1	4	1	1					
Nicollet	9	6	3	9				1	1	3				1	1		1	1	2	1						
St. Peter	3	3		3				1	1						1					1						
Nobles	1		1	1							1								1							
Norman	6	3	3	6					1		2					1		2	5	1						
Olmsted	14	9	5	14			2	1	2	2	3			1		2	1		1			1				
Rochester	6	4	2	6					1	1	2			1			1					1				
Otter Tail	18	10	8	18			2	4	1	5			2	1			2	1	7	1					2	
Fergus Falls	4	1	3	4			1	1					1				1		2						1	
Pine	6	2	4	6			1			2	2						1		3							
Pipestone	3	2	1	3					1		1							1	2							1
Polk	5	3	2	5					2				1				1	1	3	1						
Crookston	2	2		2									1					1	2							
Pope	10	5	5	10			1	2	2	1	1				1	1		1	4	3	2					
Ramsey	91	47	44	90	1		9	12	9	11	5	4	5	4	6	5	8	13	47	13	1	2	1	1	1	1
St. Paul	89	46	43	88	1		9	12	9	11	5	3	5	4	6	4	8	13	46	13	1	2	1	1	1	1

TABLE No. XVII—PNEUMONIA—BRONCHO—1909—Continued

Includes Senile Pneumonia and Infantile Pneumonia Under 2 Years of Age, Unless Specified as Lobar

COUNTY	Age					Conjugal Cond.				Birth Place			
	50 to 60	60 to 70	70 to 80	Over 80	Not Given	Single	Married	Wid. or Div'd	Not Given	Minn.	Other U. S.	Foreign	Not Given
Itasca	....	....	....	....	....	5	....	....	....	4	1	....	....
Jackson	....	1	3	....	....	5	3	1	....	5	....	4	....
Kanabec	....	....	1	....	....	....	....	1	....	....	....	1	....
Kandiyohi	....	....	1	1	....	3	2	....	....	3	1	1	....
Kittson	....	....	....	....	....	5	....	....	....	4	1	....	....
Koochiching	....	....	....	....	....	1	....	....	....	1	....	....	....
Lac qui Parle	....	....	1	....	....	7	1	....	....	6	1	1	....
Lake	....	....	....	....	....	2	....	....	....	2	....	....	....
Le Sueur	....	....	2	....	....	6	2	1	....	8	....	1	....
Lincoln	....	1	....	....	....	5	1	....	....	4	2	....	....
Lyon	....	....	1	....	....	7	....	1	....	6	....	2	....
McLeod	....	....	2	....	....	4	3	....	....	5	1	1	....
Mahnomen	....	....	....	....	....	3	....	....	....	3	....	....	....
Marshall	....	1	....	....	....	3	1	....	....	3	....	1	....
Martin	....	1	....	....	....	....	....	1	....	....	1	....	....
Meeker	....	....	....	3	....	4	2	1	....	4	2	1	....
Mille Lacs	....	....	....	....	....	....	....	....	....	....	....	....	....
Morrison	....	1	....	....	....	6	1	....	....	6	....	1	....
Little Falls	....	....	....	....	....	....	....	....	....	....	....	....	....
Mower	....	2	2	....	....	3	2	1	....	2	2	2	....
Austin	....	**2**	....	....	....	**2**	**1**	....	....	**1**	**1**	**1**	....
Murray	....	....	1	....	....	7	....	....	....	6	....	1	....
Nicollet	1	....	4	1	....	3	5	1	....	3	....	6	....
St. Peter	....	....	**2**	....	....	**1**	**1**	**1**	....	**1**	....	**2**	....
Nobles	....	....	....	....	....	1	....	....	....	1	....	....	....
Norman	....	....	....	....	....	6	....	....	....	4	2	....	....
Olmsted	2	4	2	4	....	2	10	1	1	2	6	5	1
Rochester	**1**	**1**	**1**	**2**	....	**1**	**4**	....	**1**	**1**	**1**	**3**	**1**
Otter Tail	1	1	4	2	....	9	6	3	....	8	4	6	....
Fergus Falls	....	....	**1**	....	....	**3**	**1**	....	....	**2**	....	**2**	....
Pine	....	....	2	1	....	3	1	2	....	3	....	3	....
Pipestone	....	....	....	....	....	2	1	....	....	2	1	....	....
Polk	....	....	1	....	....	4	....	1	....	4	....	1	....
Crookston	....	....	....	....	....	**2**	....	....	....	**2**	....	....	....
Pope	....	....	1	....	....	9	1	....	....	9	....	1	....
Ramsey	3	6	9	6	....	65	13	11	2	50	23	18	....
St. Paul	**2**	**6**	**9**	**6**	....	**64**	**13**	**10**	**2**	**49**	**23**	**17**	....

TABLE No. XVII—PNEUMONIA—BRONCHO—1909—Continued

Includes Senile Pneumonia and Infantile Pneumonia Under 2 Years of Age, Unless Specified as Lobar

COUNTY		Sex		Color			Date of Death												Age							
	Total	Male	Female	White	Black	Other Color	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Under One	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50
Red Lake	2	2		2				1		1						1			1					1		
Redwood	6	1	5	6					3	2	1								3	1	1					
Renville	8	3	5	8			3	1	2	1	1								7							
Rice	12	8	4	12			2		1	1	3					1	1	3	5		1					
Faribault	3	3		3							1							2	2		1					
Rock	3	3		3					1	1	1								1		1					
Roseau	2	2		2						1	1								1	1						
St. Louis	102	65	37	102			17	12	14	9	4	7	2	4	6	8	9	10	59	17	9	4	1	3	1	
Duluth	40	23	17	40			6	5	5	3	3	4	2	1	3	2	2	4	17	5	8	3		1		
Eveleth	2	1	1	2			1		1										2							
Hibbing	8	5	3	8			1			2				2	2	1			5	3						
Virginia	15	11	4	15			2	2	3	3	1	1				3			11	2	1				1	
Scott	5	4	1	5				1		1	2						1		2							
Sherburne	3	2	1	3				1	1							1			2							
Sibley	6	4	2	6			1		2	2							1		3						1	
Stearns	24	15	9	24			7	4	2	1	4					2	2	2	12	4	2					
St. Cloud	6	3	3	6			3	1			1					1			2	1	1					
Steele	10	4	6	10			2		2	1			2			2	1		2		3					
Owatonna	4	3	1	4			1		1				1			1			1		1					
Stevens	8	3	5	8			2		1	4								1	6							
Swift	5	2	3	5			1	2	1									1	5							
Todd	8	4	4	8			2	1	2	1	1	1							6							
Traverse	2	2		2				1	1										1		1					
Wabasha	4	2	2	4				1	2	1									2							
Wadena	4	1	3	4			2	1							1				1							2
Waseca	4	3	1	4					1	1	1		1						2							
Washington	6	2	4	6			1			1			1		1			2	2	1					1	
Stillwater	2	1	1	2						1			1							1					1	
Watonwan	4	1	3	4			1		1		1					1			3							
Wilkin	4	2	2	4			3	1											4							
Winona	9	6	3	9					3			2				2		2	3							
Winona	4	3	1	4					1			1				2		1	1							
Wright	13	8	5	13			3	2	4	1	1				1	1			5	1						
Yellow Medicine	7	4	3	7			1	1	4	1									6							
Total	874	485	389	870	3	1	116	115	147	125	73	33	23	23	30	54	56	79	440	88	56	13	8	11	15	9

Note: Figures for cities over 5,000 population are printed in heavy faced type, but the same figures are included in the county line preceding.

TABLE No. XVII—PNEUMONIA—BRONCHO—1909—Continued

Includes Senile Pneumonia and Infantile Pneumonia Under 2 Years of Age Unless Specified as Lobar

COUNTY	Age					Conjugal Cond.				Birth Place			
	50 to 60	60 to 70	70 to 80	Over 80	Not Given	Single	Mar-ried	Wid. or Div'd	Not Given	Minn.	Other U. S.	Foreign	Not Given
Red Lake	....	....	....	....	....	2	....	....	....	2	....	....	....
Redwood	....	....	1	....	....	5	1	....	....	5	....	1	....
Renville	....	....	1	....	....	7	....	1	....	7	....	1	....
Rice	....	....	3	3	....	6	4	2	....	6	3	3	....
Faribault	....	....	....	....	....	**3**	....	....	....	**3**	....	....	....
Rock	....	....	1	....	....	2	....	1	....	2	....	1	....
Roseau	....	....	....	....	....	2	....	....	....	2	....	....	....
St. Louis	1	2	1	4	....	93	....	7	2	85	6	10	1
Duluth	**1**	**1**	....	**4**	....	**34**	....	**4**	**2**	**30**	**4**	**5**	**1**
Eveleth	....	....	....	....	....	**2**	....	....	....	**2**	....	....	....
Hibbing	....	....	....	....	....	**8**	....	....	....	**8**	....	....	....
Virginia	....	....	....	....	....	**15**	....	....	....	**13**	**1**	**1**	....
Scott	....	....	....	3	....	2	2	1	....	2	....	3	....
Sherburne	....	....	....	....	1	2	....	....	1	2	....	....	1
Sibley	....	1	1	....	....	3	1	2	....	4	....	2	....
Stearns	....	....	4	2	....	18	3	3	....	17	2	5	....
St. Cloud	....	....	**1**	**1**	....	**4**	....	**2**	....	**4**	**1**	**1**	....
Steele	....	4	....	1	....	5	4	1	....	4	2	4	....
Owatonna	....	**2**	....	....	....	**2**	**2**	....	....	**2**	....	**2**	....
Stevens	....	....	....	2	....	6	....	1	1	5	2	1	....
Swift	....	....	....	....	....	5	....	....	....	5	....	....	....
Todd	....	....	....	2	....	6	....	2	....	6	1	1	....
Traverse	....	....	....	....	....	2	....	....	....	1	1	....	....
Wabasha	....	....	....	2	....	2	1	1	....	2	1	1	....
Wadena	....	....	....	1	....	1	2	1	....	1	2	1	....
Waseca	....	1	1	....	....	2	2	....	....	2	....	2	....
Washington	....	....	2	....	....	3	2	1	....	3	....	3	....
Stillwater	....	....	....	....	....	**1**	**1**	....	....	**1**	....	**1**	....
Watonwan	....	1	....	....	....	3	1	....	....	3	....	1	....
Wilkin	....	....	....	....	....	4	....	....	....	4	....	....	....
Winona	....	2	3	1	....	3	4	2	....	3	2	4	....
Winona	....	....	**2**	**1**	....	**1**	**1**	**2**	....	**1**	**2**	**1**	....
Wright	....	1	3	3	....	7	4	2	....	6	2	5	....
Yellow Medicine	....	....	....	1	....	6	1	....	....	6	....	1	....
Total	17	53	82	80	2	626	135	101	12	578	106	186	4

BRONCHITIS.

This disease, like pneumonia, has upon our records some debits that belong to other diseases; measles, whooping cough, the decline of old age, diseases of childhood, tuberculosis, pneumonia, etc., etc. A check is kept on deaths reported under this head in order to protect the records from any undue over-loading. In 1909 there were 141 deaths charged against acute bronchitis and 107 against chronic bronchitis. Probably some of the latter group should have been charged against tuberculosis.

The records of deaths for 1909 in Minnesota from this group of diseases are as follows:

TABLE
Bronchitis—Acute and Unqualified—

COUNTY	Total	Sex		Color			Date of Death											
		Male	Female	White	Black	Other Color	January	February	March	April	May	June	July	August	September	October	November	December
Aitkin																		
Anoka																		
Becker	1		1	1									1					
Beltrami	1		1	1												1		
Benton																		
Big Stone	1	1		1						1								
Blue Earth	1		1	1				1										
Mankato																		
Brown																		
New Ulm																		
Carlton	2	1	1	2					1			1						
Cloquet	**2**	**1**	**1**	**2**					**1**			**1**						
Carver																		
Cass	1	1		1					1									
Chippewa	1		1	1						1								
Chisago	2	1	1	2				1								1		
Clay	3	2	1	3				1			1				1			
Clearwater	2	1	1	2													2	
Cook																		
Cottonwood																		
Crow Wing																		
Brainerd																		
Dakota	1		1	1					1									
Dodge																		
Douglas																		
Faribault	2		2	2					1			1						
Fillmore	1		1	1					1									
Freeborn	1	1		1				1										
Albert Lea																		
Goodhue	2	2		2			1				1							
Red Wing																		
Grant																		
Hennepin	25	9	16	25			5	7	2	1	1	1	1	1	1	3	1	1
Minneapolis	**22**	**7**	**15**	**22**			**3**	**7**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**3**		**1**
Houston	3		3	3				1		1					1			
Hubbard																		
Isanti																		
Itasca	1		1	1					1									
Jackson	1		1	1				1										
Kanabec																		
Kandiyohi	1	1		1												1		
Kittson																		
Koochiching																		
Lac qui Parle	2	1	1	2				1								1		
Lake																		
Le Sueur	1	1		1														1
Lincoln	1	1		1						1								
Lyon	1		1	1					1									
McLeod	1	1		1				1										
Mahnomen	2	1	1	2							1				1			
Marshall																		
Martin	1	1		1					1									
Meeker	2		2	2					2									
Mille Lacs																		
Morrison	2	1	1	2					1	1								
Little Falls	**1**		**1**	**1**					**1**									
Mower	1	1		1						1								
Austin																		
Murray																		
Nicollet	4	2	2	4					2		1							1
St. Peter																		
Nobles																		
Norman	1		1	1												1		
Olmsted	3		3	3				2			1							
Rochester	**1**		**1**	**1**							**1**							
Ottertail	4	2	2	4				1	1	1	1							
Fergus Falls																		
Pine																		

NO. XVIII
Under Five Years of Age, 1909

Age													Conjugal Condition				Birth Place			
Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Not given	Single	Married	Wid.orDiv.	Not Given	Minnesota	Other U. S.	Foreign	Not Given
1													1				1			
1													1				1			
1													1				1			
1													1				1			
2													2				2			
2													**2**				**2**			
1													1				1			
1													1				1			
2													2				2			
	3												3				3			
2													2				2			
1													1				1			
2													2				2			
1													1				1			
									1					1					1	
1		1											2				2			
8	1		1					2	2	3	8		10	5	10		10	6	9	
8	**1**		**1**					**2**	**2**	**2**	**6**		**10**	**5**	**7**		**10**	**5**	**7**	
1										1	1		1	1	1			1	2	
1													1				1			
1													1				1			
1													1				1			
1	1												2				2			
											1				1				1	
										1				1					1	
1													1				1			
1													1				1			
	1	1											2				1		1	
		1											1				1			
										2					2				2	
2													2				2			
1													**1**				**1**			
1													1				1			
1								1		1		1	1	2	1		4			
1													1				1			
2									1				2		1		2	1		
									1						**1**			**1**		
1	2	1											4				4			

TABLE NO.
Bronchitis—Acute and Unqualified—

COUNTY	Total	Sex		Color			Date of Death											
		Male	Female	White	Black	Other Color	January	February	March	April	May	June	July	August	September	October	November	December
Pipestone																		
Polk	4	2	2	4							1				1	1	1	
Crookston	**3**	**2**	**1**	**3**											**1**	**1**	**1**	
Pope	1		1	1								1						
Ramsey	9	3	6	9					3			1		1		3		1
St. Paul	**7**	**3**	**4**	**7**					**3**			**1**		**1**		**1**		**1**
Red Lake																		
Redwood																		
Renville	1	1		1					1									
Rice	2	1	1	2					1				1					
Faribault																		
Rock	1		1	1							1							
Roseau																		
St. Louis	16	12	4	16			1	2	4	3	2				2	1		1
Duluth	**4**	**3**	**1**	**4**			**1**			**1**					**1**	**1**		
Eveleth																		
Hibbing																		
Virginia																		
Scott	2	1	1	2						1							1	
Sherburne																		
Sibley	1	1		1						1								
Stearns																		
St. Cloud																		
Steele																		
Owatonna																		
Stevens																		
Swift	2	1	1	2			1											1
Todd	1	1		1						1								
Traverse	1	1		1												1		
Wabasha																		
Wadena																		
Waseca	4	2	2	4			1		3									
Washington	3	2	1	3				2	1									
Stillwater	**2**		**1**	**2**				**1**	**1**									
Watonwan	1		1	1				1										
Wilkin	1	1		1										1				
Winona	5	2	3	5					2	1					1		1	
Winona	**4**	**1**	**3**	**4**					**1**	**1**					**1**		**1**	
Wright	4	3	1	4						1						1		2
Yellow Medicine	3	2	1	2		1		1	1									1
Total	141	68	73	140		1	9	24	32	16	11	5	3	3	8	15	6	9

*Figures for cities over 5,000 population are printed in heavy faced type, but the same figures are included in the county line preceding.

XVIII—Continued
Under Five Years of Age—Continued

Age													Conjugal Condition				Birth Place			
Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Not given	Single	Married	Wid.or Div.	Not Given	Minnesota	Other U. S.	Foreign	Not Given
	1	3											4				4			
	1	2											3				3			
		1											1				1			
7										1	1		7		2		7		2	
6										1			6		1		6		1	
1													1				1			
	1									1			1		1		1	1		
											1				1				1	
11	3	1								1			15	1			14		2	
4													4				4			
1								1					1	1			1		1	
1													1					1		
1										1			1	1			1		1	
1													1				1			
1													1				1			
3		1											4				4			
1							1			1			1	1	1		1		2	
							1			1				1	1				2	
	1												1				1			
1													1				1			
2				1							2		3		2		3	1	1	
1				1							2		2		2		2	1	1	
2	1										1		3		1		3		1	
2										1			2	1			2		1	
75	15	10	1	1	....	....	1	4	4	14	15	1	102	15	24	....	102	10	29	.....

TABLE XIX—BRONCHITIS—CHRONIC—1909

Includes Unqualified Over Five Years of Age, 1909

COUNTY	Total	Sex		Color			Date of Death												Age								
		Male	Female	White	Black	Other Color	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Under One	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60
Aitkin	1	1		1					1																		
Anoka	3	1	2	3					1							1	1						1				
Becker																											
Beltrami																											
Benton																											
Big Stone																											
Blue Earth	4	1	3	4							2				1		1										1
Mankato	**1**		**1**	**1**													**1**										
Brown																											
New Ulm																											
Carlton																											
Cloquet																											
Carver	2	1	1	2				1	1																	1	
Cass	2	1	1	2						1			1									1					
Chippewa	1		1	1						1																	
Chisago																											
Clay																											
Clearwater																											
Cook																											
Cottonwood																											
Crow Wing																											
Brainerd																											
Dakota	1	1		1			1																				
Dodge																											
Douglas	2		2	2					1				1														
Faribault	5	2	3	5						2	1			1		1											
Fillmore	3	2	1	3			1		2										1								
Freeborn	2		2	2						1		1												1			
Albert Lea																											
Goodhue	2	1	1	2					1				1														1
Red Wing																											
Grant																											
Hennepin	8	5	3	8			1				3					2	1	1									2
Minneapolis	**8**	**5**	**3**	**8**			**1**				**3**					**2**	**1**	**1**									**2**
Houston																											
Hubbard	1		1	1					1																		
Isanti																											

TABLE No. XIX—BRONCHITIS—CHRONIC—1909—Continued

Includes Unqualified Over Five Years of Age, 1909

COUNTY	Age				Conjugal Cond.				Birth Place			
	60 to 70	70 to 80	Over 80	Not Given	Single	Married	Wid. or Div'd	Not Given	Minn.	Other U. S.	Foreign	Not Given
Aitkin	....	1	....	....	1	....	....	....	1	....	....	....
Anoka	....	2	....	....	3	....	....	....	1	1	1	....
Becker	....	....	....	....	....	....	....	....	....	....	....	....
Beltrami	....	....	....	....	....	....	....	....	....	....	....	....
Benton	....	....	....	....	....	....	....	....	....	....	....	....
Big Stone	....	....	....	....	....	....	....	....	....	....	....	....
Blue Earth	....	1	2	....	....	1	2	1	....	2	2	....
Mankato	....	**1**	....	....	....	....	**1**	....	....	....	**1**	....
Brown	....	....	....	....	....	....	....	....	....	....	....	....
New Ulm	....	....	....	....	....	....	....	....	....	....	....	....
Carlton	....	....	....	....	....	....	....	....	....	....	....	....
Cloquet	....	....	....	....	....	....	....	....	....	....	....	....
Carver	....	1	....	....	....	2	....	....	1	....	1	....
Cass	1	....	....	....	1	1	....	....	1	....	1	....
Chippewa	....	....	1	....	....	....	1	....	....	....	1	....
Chisago	....	....	....	....	....	....	....	....	....	....	....	....
Clay	....	....	....	....	....	....	....	....	....	....	....	....
Clearwater	....	....	....	....	....	....	....	....	....	....	....	....
Cook	....	....	....	....	....	....	....	....	....	....	....	....
Cottonwood	....	....	....	....	....	....	....	....	....	....	....	....
Crow Wing	....	....	....	....	....	....	....	....	....	....	....	....
Brainerd	....	....	....	....	....	....	....	....	....	....	....	....
Dakota	....	1	....	....	....	....	1	....	....	....	1	....
Dodge	....	....	....	....	....	....	....	....	....	....	....	....
Douglas	2	....	....	....	....	2	....	....	....	1	1	....
Faribault	1	3	1	....	....	3	2	....	....	1	4	....
Fillmore	....	1	1	....	1	2	....	....	1	....	2	....
Freeborn	....	1	....	....	1	1	....	....	....	1	1	....
Albert Lea	....	....	....	....	....	....	....	....	....	....	....	....
Goodhue	....	1	....	....	....	1	1	....	....	....	2	....
Red Wing	....	....	....	....	....	....	....	....	....	....	....	....
Grant	....	....	....	....	....	....	....	....	....	....	....	....
Hennepin	....	4	2	....	2	2	3	1	....	5	3	....
Minneapolis	....	**4**	**2**	....	**2**	**2**	**3**	**1**	....	**5**	**3**	....
Houston	....	....	....	....	....	....	....	....	....	....	....	....
Hubbard	....	1	....	....	....	....	1	....	....	1	....	....
Isanti	....	....	....	....	....	....	....	....	....	....	....	....

TABLE XIX—BRONCHITIS—CHRONIC—1909—Continued

Includes Unqualified Over Five Years of Age, 1909

COUNTY	Total	Sex		Color			Date of Death												Age								
		Male	Female	White	Black	Other Color	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Under One	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60
Itasca																											
Jackson	1		1	1							1																
Kanabec																											
Kandiyohi	3	1	2	3										1		1	1						1				
Kittson																											
Koochiching																											
Lac qui Parle																											
Lake																											
Le Sueur	1	1		1								1															
Lincoln																											
Lyon	2		2	2			1			2																	
McLeod	1		1	1				1																			
Mahnomen																											
Marshall	1		1	1						1																	
Martin	1	1		1						1																	
Meeker																											
Mille Lacs																											
Morrison	3	2	1	3					1	1							1										1
Little Falls	1	1		1						1																	1
Mower	1	1		1										1													
Austin	1	1		1										1													
Murray	2	2		2					1			1															
Nicollet	4	2	2	4						1	2		1													1	
St. Peter	1		1	1							1																
Nobles																											
Norman																											
Olmsted	1	1		1					1																		
Rochester	1	1		1					1																		
Otter Tail	2	2		2									1			1			1								
Fergus Falls																											
Pine																											
Pipestone																											
Polk	2	1	1	2							1							1									
Crookston	1		1	1							1																
Pope	1		1	1							1																
Ramsey	11	3	8	11				2	3	2	1					2	1									2	1
St. Paul	11	3	8	11				2	3	2	1					2	1									2	1

TABLE No. XIX—BRONCHITIS—CHRONIC—1909—Continued

Includes Unqualified Over Five Years of Age, 1909

COUNTY	Age				Conjugal Cond.				Birth Place			
	60 to 70	70 to 80	Over 80	Not Given	Single	Married	Wid. or Div'd	Not Given	Minn.	Other U. S.	Foreign	Not Given
Itasca	....	....	....	....	....	....	....	....	....	....	....	....
Jackson	....	1	....	....	....	1	....	....	....	....	1	....
Kanabec	....	....	....	....	....	....	....	....	....	....	....	....
Kandiyohi	1	....	1	....	1	1	1	....	1	....	2	....
Kittson	....	....	....	....	....	....	....	....	....	....	....	....
Koochiching	....	....	....	....	....	....	....	....	....	....	....	....
Lac Qui Parle	....	....	....	....	....	....	....	....	....	....	....	....
Lake	....	....	....	....	....	....	....	....	....	....	....	....
Le Sueur	....	....	1	....	....	....	1	....	....	....	1	....
Lincoln	....	....	....	....	....	....	....	....	....	....	....	....
Lyon	....	1	1	....	....	....	2	....	....	....	2	....
McLeod	....	1	....	....	....	....	1	....	....	....	1	....
Mahnomen	....	....	....	....	....	....	....	....	....	....	....	....
Marshall	....	1	....	....	....	....	1	....	....	....	1	....
Martin	....	1	....	....	....	1	....	....	....	....	1	....
Meeker	....	....	....	....	....	....	....	....	....	....	....	....
Mille Lacs	....	....	....	....	....	....	....	....	....	....	....	....
Morrison	....	1	1	....	....	1	2	....	....	....	3	....
Little Falls	....	....	....	....	....	1	....	....	....	....	1	....
Mower	....	1	....	....	....	1	....	....	....	1	....	....
Austin	....	1	....	....	....	1	....	....	....	1	....	....
Murray	....	2	....	....	....	....	2	....	....	....	2	....
Nicollet	2	....	1	....	....	3	1	....	....	....	4	....
St. Peter	1	....	....	....	....	....	1	....	....	....	1	....
Nobles	....	....	....	....	....	....	....	....	....	....	....	....
Norman	....	....	....	....	....	....	....	....	....	....	....	....
Olmsted	....	....	1	....	....	....	1	....	....	....	1	....
Rochester	....	....	1	....	....	....	1	....	....	....	1	....
Otter Tail	....	....	1	....	1	....	1	....	1	1	....	....
Fergus Falls	....	....	....	....	....	....	....	....	....	....	....	....
Pine	....	....	....	....	....	....	....	....	....	....	....	....
Pipestone	....	....	....	....	....	....	....	....	....	....	....	....
Polk	1	1	....	....	....	2	....	....	....	....	2	....
Crookston	....	1	....	....	....	1	....	....	....	....	1	....
Pope	....	1	....	....	....	1	....	....	....	....	1	....
Ramsey	2	4	2	....	1	5	4	1	....	3	8	....
St. Paul	2	4	2	....	1	5	4	1	....	3	8	....

TABLE XIX—BRONCHITIS—CHRONIC—1909—Continued
Includes Unqualified Over Five Years of Age, 1909

COUNTY	Total	Sex		Color			Date of Death												Age								
		Male	Female	White	Black	Other Color	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Under One	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60
Red Lake																											
Redwood																											
Renville	3	1	2	3						1		1					1										
Rice	1		1	1												1											
Faribault																											
Rock																											
Roseau																											
St. Louis	2		2	2						1							1										
Duluth	2		2	2						1							1										
Eveleth																											
Hibbing																											
Virginia																											
Scott	3	1	2	3			1		2																		
Sherburne	1	1		1													1										
Sibley	2		2	2			1										1										1
Stearns	2	1	1	2							1	1															
St. Cloud																											
Steele	2	1	1	2														2									
Owatonna	2	1	1	2														2									
Stevens	1	1		1			1																				
Swift	1		1	1														1									
Todd																											
Traverse	1	1		1							1																
Wabasha	3	2	1	3						1		1						1									1
Wadena																											
Waseca	2		2	2							1	1															
Washington	2	1	1	2					1					1													
Stillwater																											
Watonwan																											
Wilkin	1	1		1											1												
Winona	2	2		2					1	1									1								
Winona	1	1		1					1										1								
Wright	2	1	1	2						1						1											
Yellow Medicine	2		2	2						1		1															
Total	107	47	60	107			7	4	18	19	14	8	5	4	2	10	10	6	3			1	2	1		4	8

Note: Figures for cities over 5,000 population are printed in heavy faced type, but the same figures are included in the county line preceding.

TABLE No. XIX—BRONCHITIS—CHRONIC—1909—Continued

Includes Unqualified Over Five Years of Age, 1909

COUNTY	Age				Conjugal Cond.				Birth Place			
	60 to 70	70 to 80	Over 80	Not Given	Single	Mar-ried	Wid. or Div'd	Not Given	Minn.	Other U. S.	Foreign	Not Given
Red Lake	....	....	....	....	....	....	....	....	....	....	....	....
Redwood	....	....	....	....	....	....	....	....	....	....	....	....
Renville	1	1	1	....	....	2	1	....	....	....	3	....
Rice	....	....	1	....	....	....	1	....	....	1	....	....
Faribault	....	....	....	....	....	....	....	....	....	....	....	....
Rock	....	....	....	....	....	....	....	....	....	....	....	....
Roseau	....	....	....	....	....	....	....	....	....	....	....	....
St. Louis	....	2	....	....	....	1	1	....	....	1	1	....
Duluth	....	**2**	....	....	....	**1**	**1**	....	....	**1**	**1**	....
Eveleth	....	....	....	....	....	....	....	....	....	....	....	....
Hibbing	....	....	....	....	....	....	....	....	....	....	....	....
Virginia	....	....	....	....	....	....	....	....	....	....	....	....
Scott	....	2	1	....	....	2	1	....	....	....	3	....
Sherburne	....	....	1	....	....	1	....	....	....	....	1	....
Sibley	1	....	....	....	....	2	....	....	....	....	2	....
Stearns	1	1	....	....	....	....	2	....	....	....	2	....
St. Cloud	....	....	....	....	....	....	....	....	....	....	....	....
Steele	1	1	....	....	....	1	1	....	....	1	1	....
Owatonna	**1**	**1**	....	....	....	**1**	**1**	....	....	**1**	**1**	....
Stevens	....	....	1	....	....	1	....	....	....	....	1	....
Swift	1	....	....	....	....	1	....	....	....	1	....	....
Todd	....	....	....	....	....	....	....	....	....	....	....	....
Traverse	....	....	1	....	....	1	....	....	....	....	1	....
Wabasha	2	....	....	....	....	3	....	....	....	1	2	....
Wadena	....	....	....	....	....	....	....	....	....	....	....	....
Waseca	....	2	....	....	....	....	2	....	....	1	1	....
Washington	....	2	....	....	....	1	1	....	....	....	2	....
Stillwater	....	....	....	....	....	....	....	....	....	....	....	....
Watonwan	....	....	....	....	....	....	....	....	....	....	....	....
Wilkin	....	1	....	....	....	1	....	....	....	....	1	....
Winona	....	....	1	....	1	....	1	....	1	....	1	....
Winona	....	....	....	....	**1**	....	....	....	**1**	....	....	....
Wright	....	1	1	....	....	....	2	....	....	....	2	....
Yellow Medicine	....	1	1	....	....	....	2	....	1	....	1	....
Total	17	46	25	....	13	48	43	3	9	23	75	....

INFLUENZA.

Charged against this disease in 1909 are 86 deaths. While this may be a cause of death, there is a possibility for confusion between it and pneumonia and bronchitis. Of the deaths recorded, 18 were under two years of age and 52 were over fifty years of age.

WHOOPING COUGH.

This "disease of childhood," treated lightly and often exploited by the parents of suffering children for the benefit of entire neighborhoods, has a death roll in Minnesota of 162 for 1908 and 193 for 1909. In all probability the total should be larger, for undoubtedly the records of pneumonia and bronchitis are charged up with some of the whooping cough deaths. The death records for whooping cough in Minnesota during 1909 are as follows:

TABLE
Whooping

COUNTY	Total	Sex		Color			Date of Death											
		Male	Female	White	Black	Other Color	January	February	March	April	May	June	July	August	September	October	November	December
Aitkin	1		1	1			1											
Anoka	2	1	1	2							1				1			
Becker	1	1		1														1
Beltrami	1	1		1								1						
Benton																		
Big Stone	1	1		1					1									
Blue Earth	4	3	1	4				1	2						1			
Mankato	**1**	**1**		**1**											**1**			
Brown	3	1	2	3							1		1					1
New Ulm	**1**		**1**	**1**									**1**					
Carlton	1	1		1											1			
Cloquet																		
Carver	1	1		1											1			
Cass																		
Chippewa	2	2		2						1						1		
Chisago	1	1		1							1							
Clay																		
Clearwater	4	2	2	4									1	1		1	1	
Cook	1		1	1												1		
Cottonwood																		
Crow W																		
Brainerd																		
Dakota																		
Dodge																		
Douglas	1	1		1				1										
Faribault	1	1		1					1									
Fillmore																		
Freeborn	2	1	1	2			1					1						
Albert Lea																		
Goodhue	5	1	4	5				1	1	1			2					
Red Wing																		
Grant																		
Hennepin	20	9	11	20			2	1		3		4	2		5	3		
Minneapolis	**20**	**9**	**11**	**20**			**2**	**1**		**3**		**4**	**2**		**5**	**3**		
Houston																		
Hubbard																		
Isanti																		
Itasca																		
Jackson	1		1	1			1											
Kanabec																		
Kandiyohi	2		2	2							1					1		
Kittson																		
Koochiching	1		1	1								1						
Lac qui Parle	2	1	1	2							1			1				
Lake																		
Le Sueur																		
Lincoln	2	1	1	2									1			1		
Lyon																		
McLeod	3	2	1	3							1	1			1			
Mahnomen																		
Marshall	5	2	3	5					2			1		1	1			
Martin																		
Meeker																		
Mille Lacs																		
Morrison	3	1	2	3						1	1			1				
Little Falls																		
Mower																		
Austin																		
Murray																		
Nicollet	3		3	3			1	1						1				
St. Peter	**1**		**1**	**1**			**1**											
Nobles	5	2	3	5						2				1	2			
Norman																		
Olmsted	7	1	6	7							3	1		2	1			
Rochester	**5**		**5**	**5**							**2**	**1**		**2**				
Ottertail	6	4	2	6			1	1						1	1		2	
Fergus Falls																		
Pine																		
Pipestone																		

NO. XX
Cough, 1909

Age													Conjugal Cond.				Birth Place			
Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Not Given	Single	Married	Widowed or Divorced	Not Given	Minnesota	Other U. S.	Foreign	Not Given
1													1				1			
2													2				2			
		1											1				1			
1													1				1			
1													1				1			
4													4				4			
1													1				1			
2	1												3				3			
1													1				1			
	1												1				1			
	1												1				1			
2													2				2			
1													1				1			
2	1	1											4				4			
1													1				1			
1													1				1			
1													1				1			
2													2				2			
4	1												5				4	1		
15	5												20				19	1		
15	**5**												**20**				**19**	**1**		
	1												1				1			
	1	1											2				2			
		1											1				1			
2													2				2			
1		1											2				1	1		
	2	1											3				2	1		
4			1										5				5			
2	1												3				2	1		
3													3				3			
1													1				1			
4		1											5				5			
5	2												7				7			
4	**1**												**5**				**5**			
6													6				6			

TABLE NO
Whooping Cough

COUNTY	Total	Sex		Color			Date of Death											
		Male	Female	White	Black	Other Color	January	February	March	April	May	June	July	August	September	October	November	December
Polk	3		3	3									1	1	1			
Crookston	**2**		**2**	**2**									**1**		**1**			
Pope	1		1	1							1							
Ramsey	12	5	7	11	1			1	1	6			1	2	1			
St. Paul	**12**	**5**	**7**	**11**	**1**			**1**	**1**	**6**			**1**	**2**	**1**			
Red Lake	1		1	1							1							
Redwood	4		4	4					1			1	1	1				
Renville	3	3		3								1	2					
Rice																		
Faribault																		
Rock	1	1		1									1					
Roseau	2		2	2												1		1
St. Louis	28	14	14	28			1	1	1	1	4	3	1	10	3	2	1	
Duluth	**7**	**4**	**3**	**4**			**1**				**1**	**2**		**2**	**1**			
Eveleth	**1**	**1**		**1**											**1**			
Hibbing																		
Virginia	**2**		**2**	**2**									**1**	**1**				
Scott																		
Sherburne																		
Sibley	5	3	2	5					1	2	1	1						
Stearns	5	1	4	5										3	2			
St. Cloud																		
Steele	1		1	1											1			
Owatonna	**1**		**1**	**1**											**1**			
Stevens	1		1	1					1									
Swift	2	1	1	2			1				1							
Todd	1		1	1													1	
Traverse	4	1	3	4				3	1									
Wabasha	2		2	2				1	1									
Wadena	3	1	2	3					1			1	1					
Waseca	1		1	1			1											
Washington	1	1		1				1										
Stillwater																		
Watonwan	1	1		1			1											
Wilkin	2	2		2							2							
Winona	5	1	4	5				1	1		1		1	1				
Winona	**3**	**1**	**2**	**3**				**1**	**1**				**1**					
Wright	2	1	1	2			1		1									
Yellow Medicine	5	3	2	5			2								1	2		
Total	188	81	107	187	1	....	14	14	17	17	21	17	16	27	24	13	5	3

Note: Figures for cities over 5,000 population are printed in heavy faced type, but the same figures are included in the county line preceding.

XX—Continued
1909—Continued

Age													Conjugal Cond.				Birth Place			
Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Not Given	Single	Maried	Widowed or Divorced	Not Given	Minnesota	Other U. S.	Foreign	Not Given
1	1	1	....	....	....	....	....	....	....	....	....	....	3	....	....	....	3	....	....	....
....	**1**	**1**	....	....	....	....	....	....	....	....	....	....	**2**	....	....	....	**2**	....	....	....
....	....	1	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....
8	3	....	1	....	....	....	....	....	....	....	....	....	12	....	....	....	6	6	....	....
8	**3**	....	**1**	....	....	....	....	....	....	....	....	....	**12**	....	....	....	**6**	**6**	....	....
1	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....
2	2	....	....	....	....	....	....	....	....	....	....	....	4	....	....	....	4	....	....	....
2	1	....	....	....	....	....	....	....	....	....	....	....	3	....	....	....	3	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
1	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....
1	....	1	....	....	....	....	....	....	....	....	....	....	2	....	....	....	2	....	....	....
20	4	3	1	....	....	....	....	....	....	....	....	....	28	....	....	....	26	2	....	....
5	....	**2**	....	....	....	....	....	....	....	....	....	....	**7**	....	....	....	**7**	....	....	....
1	....	....	....	....	....	....	....	....	....	....	....	....	**1**	....	....	....	**1**	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
2	....	....	....	....	....	....	....	....	....	....	....	....	**2**	....	....	....	**2**	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
3	1	....	1	....	....	....	....	....	....	....	....	....	5	....	....	....	4	1	....	....
4	1	....	....	....	....	....	....	....	....	....	....	....	5	....	....	....	5	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	1	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....
....	....	**1**	....	....	....	....	....	....	....	....	....	....	**1**	....	....	....	**1**	....	....	....
1	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....
....	2	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	2	....	....	....
....	....	....	....	1	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....
1	1	....	2	....	....	....	....	....	....	....	....	....	4	....	....	....	4	....	....	....
2	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	2	....	....	....
2	1	....	....	....	....	....	....	....	....	....	....	....	3	....	....	....	3	....	....	....
1	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....
1	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
1	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....
2	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	2	....	....	....
2	2	1	....	....	....	....	....	....	....	....	....	....	5	....	....	....	5	....	....	....
1	**1**	**1**	....	....	....	....	....	....	....	....	....	....	**3**	....	....	....	**3**	....	....	....
1	....	1	....	....	....	....	....	....	....	....	....	....	2	....	....	....	2	....	....	....
4	....	1	....	....	....	....	....	....	....	....	....	....	5	....	....	....	5	....	....	....
128	36	19	6	1	....	....	....	....	....	....	....	....	188	....	....	....	174	14	......	......

EPIDEMIC ANTERIOR POLIOMYELITIS.

This is a comparatively new disease in epidemic form in Minnesota. It was the cause of 9 deaths in 1908 and 234 deaths in 1909. The records of deaths for this disease in 1909 are as follows:

TABLE No. XXI—ANTERIOR POLIOMYELITIS—1909

COUNTY	Total	Sex		Color			Date of Birth												Age								
		Male	Fe-male	White	Black	Other Color	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Under One	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60
Aitkin	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Anoka	1	1	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...
Becker	2	1	1	2	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	...	1	...	1	...	...	...	...
Beltrami	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Benton	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Big Stone	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Blue Earth	3	...	3	3	...	...	...	...	...	...	...	...	...	...	2	...	1	...	...	...	1	2	...	...	...	...	...
Mankato	**1**	...	**1**	**1**	...	...	...	...	...	...	...	...	...	...	...	...	**1**	...	...	...	**1**	...	...	...	...	...	...
Brown	4	3	1	4	...	...	...	...	...	...	...	...	...	...	1	1	2	...	1	...	1	2	...	...	...	...	...
New Ulm	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Carlton	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cloquet	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Carver	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cass	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Chippewa	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Chisago	2	1	1	2	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	1	1	...	...	...
Clay	4	3	1	4	...	...	...	...	...	...	...	...	...	...	3	1	...	...	...	...	1	1	2	...	...	...	...
Clearwater	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cook	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cottonwood	1	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	...	...	...	...	...
Crow Wing	2	1	1	2	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	...	1	...	...	1	...	...	...
Brainerd	**1**	**1**	...	**1**	...	...	...	...	...	...	...	...	...	...	...	**1**	...	...	...	...	...	...	...	**1**	...	...	...
Dakota	8	5	3	8	...	...	...	...	...	...	...	...	...	1	2	5	...	...	3	...	2	1	1	1	...	...	...
Dodge	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Douglas	3	2	1	3	...	...	...	...	...	...	...	...	...	...	1	2	...	...	1	...	1	...	...	1	...	...	...
Faribault	6	3	3	6	...	...	...	...	...	...	...	...	...	1	4	...	1	...	1	2	...	2	1	...	...	...	...
Fillmore	1	1	...	1	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	1	...	...	...	...	...	...	...
Freeborn	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Albert Lea	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Goodhue	6	4	2	6	...	...	...	...	...	...	...	...	...	1	2	3	...	...	...	...	3	1	2	...	...	...	...
Red Wing	**1**	**1**	...	**1**	...	...	...	...	...	...	...	...	...	...	...	**1**	...	...	...	...	**1**	...	...	...	...	...	...
Grant	1	1	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	1	...	...	...
Hennepin	20	13	7	20	...	...	...	...	...	1	...	1	...	1	5	8	4	...	1	2	10	2	4	1	...	...	...
Minneapolis	**20**	**13**	**7**	**20**	...	...	...	...	...	**1**	...	**1**	...	**1**	**5**	**8**	**4**	...	**1**	**2**	**10**	**2**	**4**	**1**	...	...	...
Houston	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hubbard	2	1	1	2	...	...	...	...	...	...	...	...	...	...	...	2	...	...	1	...	...	1	...	...	...	...	...
Isanti	3	2	1	3	...	...	...	...	...	...	...	...	...	...	1	2	...	...	...	...	...	1	2	...	...	...	...

TABLE No. XXI—ANTERIOR POLIOMYELITIS—1909—Continued

COUNTY	Age				Conjugal Cond.				Birth Place				Occupation														
	60 to 70	70 to 80	Over 80	Not Given	Single	Married	Wid. or Div'd	Not Given	Minn.	Other U. S.	Foreign	Not Given	None	Farmer	Laborer	Domestic	Teamster	Teacher	Merchant	Office	Wood-worker	Woodsman	R. R.	Professional	Mechanic	Mason	General
Aitkin																											
Anoka					1				1				1														
Becker					2				2				2														
Beltrami																											
Benton																											
Big Stone																											
Blue Earth					3				3				3														
Mankato					**1**				**1**				**1**														
Brown					4				4				4														
New Ulm																											
Carlton																											
Cloquet																											
Carver																											
Cass																											
Chippewa																											
Chisago					2				2				1				1										
Clay					4				2	1	1		3		1												
Clearwater																											
Cook																											
Cottonwood					1				1				1														
Crow Wing					2				1		1		1	1													
Brainerd					**1**						**1**			**1**													
Dakota					8				7	1			7	1													
Dodge																											
Douglas					3				3				2	1													
Faribault					6				6				5														
Fillmore					1				1				1														
Freeborn																											
Albert Lea																											
Goodhue					6				6				5	1													
Red Wing					**1**				**1**				**1**														
Grant					1				1				1														
Hennepin					20				16	2	1	1	20														
Minneapolis					**20**				**16**	**2**	**1**	**1**	**20**														
Houston																											
Hubbard					2				2				2														
Isanti					3					3				2		1											

TABLE No. XXI—ANTERIOR POLIOMYELITIS—1909—Continued

COUNTY	Total	Sex		Color			Date of Birth												Age								
		Male	Female	White	Black	Other Color	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Under One	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60
Itasca	1	1	....	1	....	....	....	....	....	....	....	....	....	....	....	1	....	....	1	....	....	....	....	....	....	....	....
Jackson	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Kanabec	2	....	2	2	....	....	....	....	....	....	....	....	....	....	1	1	....	....	1	1	....	....	....	....	....	....	....
Kandiyohi	4	2	2	4	....	....	....	....	....	....	....	....	....	2	1	....	1	....	....	....	....	2	....	1	1	....	....
Kittson	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Koochiching	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Lac qui Parle	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Lake	1	....	1	1	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	1	....	....	....	....	....	....	....
Le Sueur	4	2	2	4	....	....	....	....	....	....	....	....	....	....	3	1	....	....	1	....	1	....	1	1	....	....	....
Lincoln	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Lyon	1	....	1	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	1	....	....	....	....	....	....	....
McLeod	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Mahnomen	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Marshall	1	....	1	1	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....	....	....	....
Martin	3	2	1	2	1	....	....	....	....	....	....	....	....	....	2	....	1	....	1	1	....	1	....	....	....	....	....
Meeker	3	1	2	3	....	....	....	....	....	....	....	....	....	1	1	1	....	....	....	....	2	1	....	....	....	....	....
Mille Lacs	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Morrison	1	....	1	1	....	....	....	....	1	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....
Little Falls	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Mower	3	3	....	3	....	....	....	....	....	....	....	....	1	....	....	....	2	....	....	....	....	1	1	....	....	1	....
Austin	**2**	**2**	....	**2**	....	....	....	....	....	....	....	....	....	....	....	....	**2**	....	....	....	....	....	**1**	....	....	**1**	....
Murray	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Nicollet	6	4	2	6	....	....	....	....	....	....	....	....	....	....	....	6	....	....	....	1	1	3	1	....	....	....	....
St. Peter	**5**	**3**	**2**	**5**	....	....	....	....	....	....	....	....	....	....	....	**5**	....	....	....	**1**	**1**	**3**	....	....	....	....	....
Nobles	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Norman	5	2	3	5	....	....	....	....	....	....	....	....	....	....	3	2	....	....	....	....	2	....	3	....	....	....	....
Olmsted	1	....	1	1	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	1	....
Rochester	**1**	....	**1**	**1**	....	....	....	....	....	....	....	....	....	....	....	**1**	....	....	....	....	....	....	....	....	....	**1**	....
Otter Tail	1	....	1	1	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	1	....	....	....	....	....	....
Fergus Falls	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Pine	10	5	5	10	....	....	....	....	....	....	....	....	....	4	6	....	....	....	1	1	3	3	2	....	....	....	....
Pipestone	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Polk	3	3	....	3	....	....	....	....	1	....	....	....	....	....	....	1	1	....	....	....	1	....	....	2	....	....	....
Crookston	**1**	**1**	....	**1**	....	....	....	....	....	....	....	....	....	....	....	....	**1**	....	....	....	....	....	....	**1**	....	....	....
Pope	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Ramsey	59	32	27	59	....	....	....	....	....	....	....	....	....	27	24	4	2	2	11	10	18	9	7	2	1	1	....
St. Paul	**54**	**30**	**24**	**54**	....	....	....	....	....	....	....	....	....	**26**	**22**	**3**	**2**	**1**	**10**	**10**	**16**	**8**	**6**	**2**	**1**	**1**	....

TABLE No. XXI—ANTERIOR POLIOMYELITIS—1909—Continued

COUNTY	Age				Conjugal Cond.				Birth Place				Occupation														
	60 to 70	70 to 80	Over 80	Not Given	Single	Married	Wid. or Div'd	Not Given	Minn.	Other U. S.	Foreign	Not Given	None	Farmer	Laborer	Domestic	Teamster	Teacher	Merchant	Office	Woodworker	Woodsman	R. R.	Professional	Mechanic	Mason	General
Itasca					1				1				1														
Jackson																											
Kanabec					2				2				2														
Kandiyohi					3	1			3	1			2	1						1							
Kittson																											
Koochiching																											
Lac qui Parle																											
Lake					1				1				1														
Le Sueur					4				4				4														
Lincoln																											
Lyon					1				1				1														
McLeod																											
Mahnomen																											
Marshall					1				1				1														
Martin					3				3				3														
Meeker					3				2	1			3														
Mille Lacs																											
Morrison					1				1				1														
Little Falls																											
Mower					2	1			2	1			2	1													
Austin					1	1			1	1			1	1													
Murray																											
Nicollet					6				6				6														
St. Peter					5				5				5														
Nobles																											
Norman					5				4	1			5														
Olmsted						1			1				1														
Rochester						1			1				1														
Otter Tail					1				1				1														
Fergus Falls																											
Pine					10				9		1		10														
Pipestone																											
Polk					3				3				1		2												
Crookston					1				1						1												
Pope																											
Ramsey					59				37	19	3		55	1	1				1					1			
St. Paul					54				34	17	3		50	1	1				1					1			

TABLE No. XXI—ANTERIOR POLIOMYELITIS—1909—Continued

COUNTY	Total	Sex		Color			Date of Birth												Age								
		Male	Female	White	Black	Other Color	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Under One	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60
Red Lake	1	....	1	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....	....	....
Redwood	1	....	1	1	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	1	....	....	....
Renville	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Rice	5	1	4	5	....	....	....	....	....	....	....	....	....	1	1	3	....	....	....	1	....	1	2	1	....	....	....
Faribault	**1**	**1**	....	**1**	....	....	....	....	....	....	....	....	....	....	....	**1**	....	....	....	....	....	**1**	....	....	....	....	....
Rock	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Roseau	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
St. Louis	3	3	....	3	....	....	....	....	....	....	....	....	....	....	1	2	....	....	....	....	2	....	....	1	....	....	....
Duluth	**2**	**2**	....	**2**	....	....	....	....	....	....	....	....	....	....	....	**2**	....	....	....	....	**2**	....	....	....	....	....	....
Eveleth	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Hibbing	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Virginia	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Scott	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Sherburne	1	....	1	1	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....	....	....	....	....
Sibley	1	....	1	1	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	1	....	....	....	....	....	....
Stearns	5	2	3	5	....	....	....	....	....	....	....	....	....	1	....	1	2	1	1	....	....	1	2	1	....	....	....
St. Cloud	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Steele	3	2	1	3	....	....	1	....	....	....	....	....	....	....	1	1	....	....	1	....	....	1	1	....	....	....	....
Owatonna	**2**	**1**	**1**	**2**	....	....	**1**	....	....	....	....	....	....	....	....	**1**	....	....	**1**	....	....	**1**	....	....	....	....	....
Stevens	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Swift	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Todd	3	1	2	3	....	....	....	....	....	....	....	....	....	....	1	1	1	....	1	....	1	1	....	....	....	....	....
Traverse	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Wabasha	3	1	2	3	....	....	....	....	....	....	....	....	....	....	2	1	....	....	....	1	1	1	....	....	....	....	....
Wadena	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Waseca	2	2	....	2	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	1	....	....	1	....	....	....	....
Washington	10	8	2	10	....	....	....	....	....	....	....	....	....	2	2	5	1	....	2	1	3	2	1	1	....	....	....
Stillwater	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Watonwan	1	1	....	1	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	1	....	....	....	....
Wilkin	2	2	....	2	....	....	....	....	....	....	....	....	....	....	1	1	....	....	....	....	1	....	1	....	....	....	....
Winona	7	3	4	7	....	....	....	....	....	....	....	....	1	5	1	....	....	....	....	....	2	1	3	1	....	....	....
Winona	**4**	**1**	**3**	**4**	....	....	....	....	....	....	....	....	**1**	**2**	**1**	....	....	....	....	....	**1**	....	**2**	**1**	....	....	....
Wright	6	4	2	6	....	....	....	....	....	....	....	....	....	3	1	2	....	....	2	1	1	1	1	....	....	....	....
Yellow Medicine	2	1	1	2	....	....	....	....	....	....	....	....	....	....	1	....	1	....	....	....	1	....	1	....	....	....	....
Total	234	131	103	133	1	....	1	....	2	2	....	1	2	55	77	66	22	6	33	28	64	43	43	18	2	3	....

Note: Figures for cities over 5,000 population are printed in heavy faced type. but the same figures are included in the county line preceding.

TABLE No. XXI—ANTERIOR POLIOMYELITIS—1909—Continued

COUNTY	Age				Conjugal Cond.				Birth Place				Occupation														
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Red Lake					1				1				1														
Redwood					1				1				1														
Renville																											
Rice					5				5				5														
Faribault					1				1				1														
Rock																											
Roseau																											
St. Louis					3				1	2			2										1				
Duluth					2				1	1			2														
Eveleth																											
Hibbing																											
Virginia																											
Scott																											
Sherburne					1				1				1														
Sibley					1				1				1														
Stearnes					5				4	1			5														
St. Cloud																											
Steele					3				3				3														
Owatonna					2				2				2														
Stevens																											
Swift																											
Todd					3				3				3														
Traverse																											
Wabasha					3				2	1			3														
Wadena																											
Waseca					2				2				2														
Washington					10				9	1			9								1						
Stillwater																											
Watonwan					1					1			1														
Wilkin					2				2				2														
Winona					7				5	1	1		7														
Winona					4				3	1			4														
Wright					6				6				6														
Yellow Medicine					2				2				2														
Total					231	3			191	34	8	1	216	7	5		1		1	1	1		1	1			

EPIDEMIC CEREBRO-SPINAL MENINGITIS.

This disease shows a very low death rate in Minnesota for the years 1908 and 1909, there being only four deaths for each year.

TETANUS.

Of the 23 deaths due to this disease in 1909, 3 occurred in June, 6 in July, 2 in August and 4 in September.

DIARRHOEAL DISEASES OF CHILDREN.

This group of diseases is second only to tuberculosis and pneumonia as a cause of death in Minnesota, the records for 1908 showing 1,291 deaths and for 1909, 1,374 deaths.

The statistics of deaths are as follows:

TABLE NO. XXII—DIARRHOEAL DISEASES OF

COUNTY	Total	Sex		Color			Date of Death											
		Male	Female	White	Black	Other Color	January	February	March	April	May	June	July	August	September	October	November	December
Aitkin	5	3	2	5								1		2		2		
Anoka	5	2	3	5								2	1		1		1	
Becker	12	8	4	12			2	2	1					1	4	1	1	
Beltrami	21	12	9	21				2					2	8	6	2	1	
Benton	7	5	2	7			2			1	1		2	1				
Big Stone	3	2	1	3					1		1					1		
Blue Earth	10	6	4	10			1		1	1	1			1	3		1	1
Mankato	**5**	**3**	**2**	**5**			**1**		**1**						**2**		**1**	
Brown	17	13	4	17			1	1		2		4	1	1	3	4		
New Ulm	**4**	**3**	**1**	**4**				**1**				**2**				**1**		
Carlton	13	8	5	13				1		2	1		1	5	2		1	
Cloquet	**4**	**2**	**2**	**4**						**1**				**2**	**1**			
Carver	9	7	2	9				1	1					3	1	3		
Cass	1	1		1										1				
Chippewa	4	3	1	4						1		2			1			
Chisago	5	4	1	5					1					1	1	1		1
Clay	10	7	3	10			1			1		3			2		1	2
Clearwater	2	1	1	2					1							1		
Cook	1	1		1									1					
Cottonwood	4	3	1	4						1	1					1		1
Crow Wing	15	6	9	15			1	1		3	2	1	1	1	3	1		1
Brainerd	**5**	**3**	**2**	**5**							**1**	**1**		**1**	**2**			
Dakota	5	2	3	5				1	1					1	1	1		
Dodge	3	2	1	3											1	2		
Douglas	1		1	1												1		
Faribault	5	4	1	5			1			3				1				
Fillmore	13	6	7	13			1			3		1		1	5		1	8
Freeborn	7	4	3	7			1					2	1		2	1		
Albert Lea																		
Goodhue	11	9	2	11				3						2	5	1		
Red Wing	**3**	**2**	**1**	**3**										**1**	**1**	**1**		
Grant	1	1		1			1											
Hennepin	180	93	87	178	2		7	7	5	8	10	10	10	47	37	26	8	5
Minneapolis	**175**	**89**	**86**	**173**	**2**		**7**	**7**	**5**	**8**	**9**	**10**	**10**	**44**	**37**	**25**	**8**	**5**
Houston	3	1	2	3							1	1						1
Hubbard	6	4	2	6						1						4		1
Isanti	7	4	3	7											5	1		1
Itasca	27	16	11	27					1			1	2	15	4	3	1	
Jackson	4	2	2	4			1			1		1					1	
Kanabec	2	1	1	2												1	1	
Kandiyohi	4	3	1	4							1	1		1		1		
Kittson	7	4	3	7				1	1						5			
Koochiching	1	1		1											1			
Lac qui Parle	5	2	3	5										1	3	1		
Lake	17	8	9	17			1		2	3		1	1	3	4	2		
Le Seuur	5	1	4	5				1	1	1	1						1	
Lincoln	5	1	4	5					1		1			1	2			
Lyon	11	9	2	11				1			1	1	1	3	1	1	2	
McLeod	7	2	5	7			2	1						1	2	1		
Mahnomen																		
Marshall	8	5	3	8			1			1	2	1		1	1	1		
Martin	6	2	4	6			1				1	1		1	2			
Meeker	2	2		2						1					1			
Mille Lacs	3	1	2	3				1			1				1			
Morrison	14	8	6	14			1					1	1	1	6	3	1	
Little Falls	**5**	**3**	**2**	**5**			**1**					**1**			**2**	**1**		
Mower	11	4	7	11						2			1	2	3	1	2	
Austin	**2**		**2**	**2**						**1**				**1**				
Murray	3	2	1	3										1	1	1		
Nicollet	13	7	6	13			1	1	2	1	1			2	2	2	1	
St. Peter	**2**	**1**	**1**	**2**										**1**		**1**		
Nobles	5	3	2	5			1		1				1				1	1
Norman	15	5	10	15			1	2						1	4	4	2	1
Olmsted	5	1	4	5										1	2	1	1	
Rochester	**2**	**1**	**1**	**2**										**1**		**1**		
Otter Tail	22	13	9	22			2		3	1			2	8	3	2		1
Fergus Falls	**4**	**3**	**1**	**4**										**3**	**1**			
Pine	8	5	3	8				1	1					2	2	1	1	
Pipestone	1		1	1											1			
Polk	18	9	9	18			2	1	1	1	1		1	2	2	5	2	

CHILDREN UNDER TWO YEARS OF AGE, 1909

Age												Conjugal condition				Birth Place			
Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Maried	Widowed or Divorced	Not Given	Minnesota	Other U.S.	Foreign	Not Given
4	1											5				5			
5												5				5			
8	4											12				11	1		
18	3											21				20	1		
7												7				7			
3												3				3			
7	3											10				9		1	
3	2											5				4		1	
16	1											17				16	1		
4												4				3	1		
11	2											13				13			
2	2											4				4			
6	3											9				9			
1												1				1			
3	1											4				4			
5												5				5			
9	1											10				9	1		
2												2				1	1		
1												1				1			
4												4				4			
11	4											15				15			
5												5				5			
5												5				5			
2	1											3				3			
...	1											1				1			
3	2											5				4	1		
8												13				11	2		
7												7				7			
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11												11				11			
3												3				3			
1												1				1			
154	26											180				168	8	2	2
150	25											175				163	8	2	2
2	1											3				3			
5	1											6				6			
6	1											7				7			
23	4											27				26	1		
4												4				4			
1	1											2				2			
4												4				4			
5	2											7				7			
1												1				1			
3	2											5				5			
14	3											17				16	1		
5												5				5			
5												5				5			
9	2											11				9	2		
5	2											7				7			
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	1											8				7	1		
6												6				6			
1	1	1										2				2			
2	1											3				3			
12	2											14				14			
5												5				5			
5	6											11				11			
...	2											2				2			
2	1											3				3			
11	2											13				13			
1	1											2				2			
5												5				4	1		
12	3											15				14	1		
5												5				5			
2												2				2			
18	4											22				22			
4												4				4			
7	1											8				7		1	
1												1				1			
17	1											18				17	1		

TABLE NO. XXII—DIARRHOEAL DISEASES OF CHILD

COUNTY	Total	Sex		Color			Date of Death											
		Males	Females	White	Black	Other Color	January	February	March	April	May	June	July	August	September	October	November	December
Crookston	**5**	**2**	**3**	**5**	....	....	**1**	....	....	....	....	....	**1**	**1**	**1**	**1**	....	....
Pope	6	3	3	6	....	....	....	....	1	2	1	1	....	....	....	1	....	....
Ramsey	175	107	68	175	....	....	7	7	5	6	7	7	11	62	33	11	13	6
St. Paul	**172**	**105**	**67**	**172**	....	....	**7**	**7**	**5**	**6**	**7**	**7**	**11**	**62**	**30**	**11**	**13**	**6**
Red Lake	11	6	5	11	....	....	....	....	....	1	2	1	2	3	1	1	....	....
Redwood	8	4	4	8	....	....	....	1	1	....	....	2	....	1	2	1	....	....
Renville	6	2	4	6	....	....	....	....	....	....	1	....	....	1	2	1	....	1
Rice	9	5	4	9	....	....	3	....	2	....	....	....	1	1	....	1	1	....
Faribault	**1**	....	**1**	**1**	....	....	....	....	....	....	....	....	**1**	....	....	....	....	....
Rock	4	2	2	4	....	....	....	....	....	1	1	....	....	....	1	1	....	....
Roseau	3	....	3	3	....	....	....	....	....	....	1	1	....	....	1	....	....	....
St. Louis	272	137	135	272	....	....	8	8	12	13	7	8	19	90	71	13	8	15
Duluth	**111**	**53**	**58**	**111**	....	....	**2**	**3**	**5**	**3**	**3**	**1**	**7**	**36**	**33**	**5**	**4**	**9**
Eveleth	**10**	**4**	**6**	**10**	....	....	....	**1**	**1**	....	**2**	**2**	....	**4**	....	....	....	....
Hibbing	**18**	**7**	**11**	**18**	....	....	....	....	**2**	**1**	....	....	**1**	**8**	**4**	**2**	....	....
Virginia	**25**	**15**	**10**	**25**	....	....	....	**2**	....	**1**	**1**	**2**	**2**	**11**	**3**	**1**	**1**	**1**
Scott	8	3	5	8	....	....	....	2	1	....	1	....	....	....	....	1	2	1
Sherburn	4	1	3	4	....	....	1	1	....	....	1	....	....	....	....	1	....	....
Sibley	9	6	3	9	....	....	....	....	....	1	....	....	....	2	1	2	1	2
Stearns	21	11	10	21	....	....	2	1	2	1	1	....	....	3	6	5	....	....
St. Cloud	**4**	**4**	....	**4**	....	....	....	**1**	....	**1**	....	....	....	**1**	**1**	....	....	....
Steele	5	4	1	5	....	....	1	1	1	....	....	....	....	....	1	....	....	1
Owatonna	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Stevens	5	4	1	5	....	....	....	....	....	1	1	....	....	....	....	3	....	....
Swift	10	6	4	10	....	....	....	....	1	2	....	1	....	2	....	1	2	1
Todd	10	5	5	10	....	....	....	....	....	....	1	3	....	2	1	1	2	....
Traverse	5	1	4	5	....	....	1	....	1	....	....	....	....	....	2	1	....	....
Wabasha	7	7	....	7	....	....	1	....	....	....	....	....	1	....	4	1	....	....
Wadena	6	5	1	6	....	....	....	....	....	....	1	....	....	1	1	3	....	....
Waseca	2	1	1	2	....	....	....	....	....	....	....	1	....	....	1	....	....	....
Washington	9	5	4	9	....	....	....	....	1	....	....	....	....	....	4	1	1	2
Stillwater	**3**	**2**	**1**	**3**	....	....	....	....	....	....	....	....	....	....	**2**	....	....	**1**
Watonwan	6	4	2	6	....	....	....	....	1	1	....	....	....	....	1	1	1	1
Wilkin	4	4	....	4	....	....	....	....	....	....	....	1	1	1	....	....	1	....
Winona	18	10	8	18	....	....	....	4	....	1	1	1	....	3	7	....	....	1
Winona	**11**	**8**	**3**	**11**	....	....	....	**2**	....	....	....	....	....	**3**	**5**	....	....	**1**
Wright	9	5	4	9	....	....	....	2	1	....	1	....	1	1	1	1	....	1
Yellow Medicine	7	3	4	7	....	....	....	....	1	....	....	....	1	1	2	1	....	1
Total	1254	690	564	1252	2	....	57	56	57	69	56	62	67	298	275	143	63	51

Note: Figures for cities over 5,000 population are printed in heavy faced type, but the same figures are included in the county line preceding.

REN UNDER TWO YEARS OF AGE, 1909—Continued

Age												Conjugal condition				Birth Place			
Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Widowed or Divorced	Not Given	Minnesota	Other U.S.	Foreign	Not Given
5	....	....	....	....	....	....	....	....	....	....	....	5	....	....	....	5	....	....	....
5	1	....	....	....	....	....	....	....	....	....	....	6	....	....	....	6	....	....	....
150	25	....	....	....	....	....	....	....	....	....	....	175	....	....	....	130	45	....	....
148	24	....	....	....	....	....	....	....	....	....	....	172	....	....	....	127	45	....	....
8	3	....	....	....	....	....	....	....	....	....	....	11	....	....	....	10	1	....	....
5	3	....	....	....	....	....	....	....	....	....	....	8	....	....	....	7	1	....	....
4	2	....	....	....	....	....	....	....	....	....	....	6	....	....	....	5	1	....	....
6	3	....	....	....	....	....	....	....	....	....	....	9	....	....	....	9	....	....	....
....	1	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....
4	....	....	....	....	....	....	....	....	....	....	....	4	....	....	....	4	....	....	....
3	....	....	....	....	....	....	....	....	....	....	....	3	....	....	....	3	....	....	....
235	37	....	....	....	....	....	....	....	....	....	....	272	....	....	....	262	9	1	....
95	16	....	....	....	....	....	....	....	....	....	....	111	....	....	....	106	5	....	....
10	....	....	....	....	....	....	....	....	....	....	....	10	....	....	....	9	1	....	....
17	1	....	....	....	....	....	....	....	....	....	....	18	....	....	....	18	....	....	....
21	4	....	....	....	....	....	....	....	....	....	....	25	....	....	....	23	1	1	....
8	....	....	....	....	....	....	....	....	....	....	....	8	....	....	....	8	....	....	....
2	2	....	....	....	....	....	....	....	....	....	....	4	....	....	....	4	....	....	....
8	1	....	....	....	....	....	....	....	....	....	....	9	....	....	....	9	....	....	....
15	6	....	....	....	....	....	....	....	....	....	....	21	....	....	....	21	....	....	....
3	1	....	....	....	....	....	....	....	....	....	....	4	....	....	....	4	....	....	....
5	....	....	....	....	....	....	....	....	....	....	....	5	....	....	....	5	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
4	1	....	....	....	....	....	....	....	....	....	....	5	....	....	....	5	....	....	....
8	2	....	....	....	....	....	....	....	....	....	....	10	....	....	....	10	....	....	....
7	3	....	....	....	....	....	....	....	....	....	....	10	....	....	....	10	....	....	....
4	1	....	....	....	....	....	....	....	....	....	....	5	....	....	....	5	....	....	....
6	1	....	....	....	....	....	....	....	....	....	....	7	....	....	....	7	....	....	....
6	....	....	....	....	....	....	....	....	....	....	....	6	....	....	....	6	....	....	....
1	1	....	....	....	....	....	....	....	....	....	....	2	....	....	....	2	....	....	....
8	1	....	....	....	....	....	....	....	....	....	....	9	....	....	....	9	....	....	....
2	1	....	....	....	....	....	....	....	....	....	....	3	....	....	....	3	....	....	....
5	1	....	....	....	....	....	....	....	....	....	....	6	....	....	....	6	....	....	....
3	1	....	....	....	....	....	....	....	....	....	....	4	....	....	....	4	....	....	....
14	4	....	....	....	....	....	....	....	....	....	....	18	....	....	....	17	1	....	....
8	3	....	....	....	....	....	....	....	....	....	....	11	....	....	....	11	....	....	....
7	2	....	....	....	....	....	....	....	....	....	....	9	....	....	....	9	....	....	....
7	....	....	....	....	....	....	....	....	....	....	....	7	....	....	....	7	....	....	....
1053	201	....	....	....	....	....	....	....	....	....	....	1254	....	....	....	1,165	82	5	2

TABLE XXIII—DIARRHOEAL DISEASES OF CHILDREN

COUNTY	Total	Sex		Color			Time of Death											
		Males	Females	White	Black	Other Color	January	February	March	April	May	June	July	August	September	October	November	December
Aitkin																		
Anoka																		
Becker	2	2		2						1						1		
Beltrami	3	3		3				1							1		1	
Benton	2	2		2								1						1
Big Stone	2		2	2									1		1			
Blue Earth	2		2	2											2			
Mankato	**2**		**2**	**2**											**2**			
Brown	1		1	1										1				
New Ulm																		
Carlton																		
Cloquet																		
Carver																		
Cass																		
Chippewa	1	1		1														1
Chisago																		
Clay																		
Clearwater																		
Cook																		
Cottonwood																		
Crow Wing	1		1	1										1				
Brainerd	**1**		**1**	**1**										**1**				
Dakota	1	1		1									1					
Dodge																		
Douglas																		
Faribault	1		1	1											1			
Fillmore	3	1	2	3										1	1			1
Freeborn	2	1	1	2										1	1			
Albert Lea	**2**	**1**	**1**	**2**										**1**	**1**			
Goodhue	1		1	1													1	
Red Wing																		
Grant	1		1	1												1		
Hennepin	11	6	5	11				1	1				1	2	2	4		
Minneapolis	**10**	**5**	**5**	**10**				**1**					**1**	**2**	**2**	**4**		
Houston	4		4	4				1						2	1			
Hubbard	1	1		1											1			
Isanti																		
Itasca	1		1	1					1									
Jackson																		
Kanabec	1	1		1											1			
Kandiyohi	1	1		1											1			
Kittson																		
Koochiching	1	1		1							1							
Lac Qui Parle	1		1	1														1
Lake	2	1	1	2								1				1		
Le Sueur																		
Lincoln																		
Lyon																		
McLeod																		
Mahnomen	1	1		1										1				
Marshall																		
Martin																		
Meeker																		
Mille Lacs	2		2	2						1					1			
Morrison	1		1	1										1				
Little Falls																		
Mower	3	3		3								1		1	1			
Austin	**1**	**1**		**1**										**1**				
Murray																		
Nicollet																		
St. Peter																		
Nobles	3	1	2	3											2	1		
Norman	1	1		1												1		
Olmsted																		
Rochester																		
Otter Tail	2		2	2					1						1			
Fergus Falls																		
Pine																		
Pipestone																		
Polk	1		1												1			

FROM TWO TO FIVE YEARS OF AGE, 1909

Age												Conjugal condition				Birth Place			
Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 o 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Widowed or Divorced	Not Given	Minnesota	Other U. S.	Foreign	Not Given
		2										2				2			
		3										3				3			
		2										2				1	1		
		2										2				2			
		2										2				2			
		2										2				2			
		1										1				1			
		1										1				1			
		1										1				1			
		1										1				1			
		1										1				1			
		1										1				1			
		3										3				2	1		
		2										2				2			
		2										2				2			
		1										1				1			
		1										1				1			
		11										11				10		1	
		10										10				9		1	
		4										4				3	1		
		1										1				1			
		1										1				1			
		1										1				1			
		1										1				1			
		1										1				1			
		1										1				1			
		2										2				2			
		1										1				1			
		2										2				2			
		1										1					1		
		3										3				3			
		1										1				1			
		3										3				1	2		
		1										1				1			
		2										2				2			
		1										1				1			

TABLE XXIII—DIARRHOEAL DISEASES OF CHILDREN

COUNTY	Total	Sex		Color			Time of Death											
		Males	Females	White	Black	Other Color	January	February	March	April	May	June	July	August	September	October	November	December
Crookston	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Pope	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Ramsey	10	5	5	10	....	....	1	....	....	1	2	....	....	1	2	....	3	....
St. Paul	**8**	**4**	**4**	**8**	....	....	**1**	....	....	**1**	**1**	....	....	**1**	**1**	....	**3**	....
Red Lake	2	1	1	2	....	....	....	....	....	....	1	....	....	....	....	....	....	1
Redwood	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Renville	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Rice	2	2	....	2	....	....	....	....	1	....	....	....	....	....	....	....	....	1
Faribault	**1**	**1**	....	**1**	....	....	....	....	....	....	....	....	....	....	....	....	....	**1**
Rock	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Roseau	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
St. Louis	8	6	2	8	....	....	....	....	2	....	....	....	1	1	1	....	3	....
Duluth	**1**	**1**	....	**1**	....	....	....	....	....	....	....	....	....	....	....	....	**1**	....
Eveleth	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Hibbing	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Virginia	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Scott	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Sherburn	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Sibley	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Stearns	4	2	2	4	....	....	....	....	1	....	....	....	1	1	....	1	....	....
St. Cloud	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Steele	1	1	....	1	....	....	....	....	1	....	....	....	....	....	....	....	....	....
Owatonna	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Stevens	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Swift	2	1	1	2	....	....	....	1	....	....	....	....	....	....	1	....	....	....
Todd	1	1	....	1	....	....	....	....	....	....	....	....	....	....	1	....	....	....
Traverse	1	....	1	1	....	....	....	....	....	1	....	....	....	....	....	....	....	....
Wabasha	1	1	....	1	....	....	....	....	....	....	....	....	....	....	1	....	....	....
Wadena	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Waseca	1	1	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Washington	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Stillwater	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Watonwan	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Wilkin	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Winona	3	2	1	3	....	....	....	....	....	....	....	....	....	....	2	....	1	....
Winona	**2**	**1**	**1**	**2**	....	....	....	....	....	....	....	....	....	....	**2**	....	....	....
Wright	2	1	1	2	....	....	....	....	1	....	....	....	....	....	....	....	1	....
Yellow Medicine	1	1	....	1	....	....	....	....	....	1	....	....	....	....	....	....	....	....
Total	99	53	46	99	....	....	1	4	9	5	5	2	5	14	28	9	10	7

Note: Figures for cities over 5,000 population are printed in heavy faced type, but the same figures are included in the county line preceding.

FROM TWO TO FIVE YEARS OF AGE, 1909—Continued

Age												Conjugal condition				Birth Place			
Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Widowed or Divorced	Not Given	Minnesota	Other U. S.	Foreign	Not Given
		10										10				5	4	1	
		8										8				3	4	1	
		2										2				1	1		
		2										2				2			
		1										1				1			
		8										8				7	1		
		1										1				1			
		4										4				4			
		1										1				1			
		2										2				2			
		1										1				1			
		1										1				1			
		1										1				1			
		1										1				1			
		3										3				3			
		2										2				2			
		2										2				2			
		1										1				1			
		99										99				85	12	2	

TABLE XXIII—DIARRHOEAL DISEASES OF CHILDREN

COUNTY	Total	Sex		Color			Time of Death											
		Males	Females	White	Black	Other Color	January	February	March	April	May	June	July	August	September	October	November	December
Crookston	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Pope	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Ramsey	10	5	5	10	....	....	1	....	....	1	2	....	....	1	2	....	3	....
St. Paul	**8**	**4**	**4**	**8**	....	....	**1**	....	....	**1**	**1**	....	....	**1**	**1**	....	**3**	....
Red Lake	2	1	1	2	....	....	....	....	....	....	1	....	....	....	....	....	....	1
Redwood	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Renville	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Rice	2	2	....	2	....	....	....	....	1	....	....	....	....	....	....	....	....	1
Faribault	**1**	**1**	....	**1**	....	....	....	....	....	....	....	....	....	....	....	....	....	**1**
Rock	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Roseau	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
St. Louis	8	6	2	8	....	....	....	....	2	....	....	....	1	1	1	....	3	....
Duluth	**1**	**1**	....	**1**	....	....	....	....	....	....	....	....	....	....	....	....	**1**	....
Eveleth	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Hibbing	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Virginia	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Scott	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Sherburn	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Sibley	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Stearns	4	2	2	4	....	....	....	....	1	....	....	....	1	1	....	1	....	....
St. Cloud	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Steele	1	1	....	1	....	....	....	....	1	....	....	....	....	....	....	....	....	....
Owatonna	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Stevens	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Swift	2	1	1	2	....	....	....	1	....	....	....	....	....	....	1	....	....	....
Todd	1	1	....	1	....	....	....	....	....	....	....	....	....	....	1	....	....	....
Traverse	1	....	1	1	....	....	....	....	....	1	....	....	....	....	....	....	....	....
Wabasha	1	1	....	1	....	....	....	....	....	....	....	....	....	....	1	....	....	....
Wadena	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Waseca	1	1	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Washington	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Stillwater	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Watonwan	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Wilkin	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Winona	3	2	1	3	....	....	....	....	....	....	....	....	....	....	2	....	1	....
Winona	**2**	**1**	**1**	**2**	....	....	....	....	....	....	....	....	....	....	**2**	....	....	....
Wright	2	1	1	2	....	....	....	....	1	....	....	....	....	....	....	....	1	....
Yellow Medicine	1	1	....	1	....	....	....	....	....	1	....	....	....	....	....	....	....	....
Total	99	53	46	99	....	....	1	4	9	5	5	2	5	14	28	9	10	7

Note: Figures for cities over 5,000 population are printed in heavy faced type, but the same figures are included in the county line preceding.

FROM TWO TO FIVE YEARS OF AGE, 1909—Continued

Age												Conjugal condition				Birth Place			
Under 1	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	Over 80	Single	Married	Widowed or Divorced	Not Given	Minnesota	Other U. S.	Foreign	Not Given
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	10	....	....	....	....	....	....	....	....	....	10	....	....	....	5	4	1	....
....	....	8	....	....	....	....	....	....	....	....	....	8	....	....	....	3	4	1	....
....	....	2	....	....	....	....	....	....	....	....	....	2	....	....	....	1	1	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	2	....	....	....	....	....	....	....	....	....	2	....	....	....	2	....	....	....
....	....	1	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	8	....	....	....	....	....	....	....	....	....	8	....	....	....	7	1	....	....
....	....	1	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
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....	....	4	....	....	....	....	....	....	....	....	....	4	....	....	....	4	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	1	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....
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....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	2	....	....	....	....	....	....	....	....	....	2	....	....	....	2	....	....	....
....	....	1	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....
....	....	1	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....
....	....	1	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	1	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....
....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
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....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
....	....	3	....	....	....	....	....	....	....	....	....	3	....	....	....	3	....	....	....
....	....	2	....	....	....	....	....	....	....	....	....	2	....	....	....	2	....	....	....
....	....	2	....	....	....	....	....	....	....	....	....	2	....	....	....	2	....	....	....
....	....	1	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....
....	....	99	....	....	....	....	....	....	....	....	....	99	....	....	....	85	12	2	....

CANCER.

There is a general tendency to think that cancer is on the increase. The records would seem to bear this out, for they show 1,259 and 1,226, respectively, for 1908 and 1909, against 662 in 1890 and 879 in 1894. However, the vagaries in diagnosis and the greater amount of operative work in dealing with malignant growths may have something to do with this great increase in the number of deaths reported.

The statistics of deaths for 1909 are shown below:

TABLE No. XXIVA—CANCER, ALL FORMS—1909—Continued

COUNTY	Total	Sex		Color			Date of Death												Age								
		Male	Fe-male	White	Black	Other Color	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Under One	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60
Aitkin	6	2	4	6			1	2					1		1			1						1	1		1
Anoka	7	3	4	7					1	1	1		1	1		1		1							1	2	1
Becker	9	7	2	9					1				1	1	3	1	2									2	1
Beltrami	4	3	1	4						1		1		1			1								1		2
Benton	2	2		2													2									2	
Big Stone	2	2		2					1				1														
Blue Earth	29	11	18	29			4	1	1	4	2	1	5		5	2	1	3							1		10
Mankato	19	7	12	19			4	1		3	1	1	4		3	1		1							1		7
Brown	12	6	6	12			2	1	1			1			2	1	3	1								1	1
New Ulm	9	5	4	9			2	1				1			1	1	2	1									1
Carlton	9	6	3	9					1	2			1		2	1	2									2	4
Cloquet																											
Carver	13	7	6	13			1	3	1	1	2		1	1	2		1						1	1	1	2	5
Cass	3		3	3				1								1	1									2	
Chippewa	9	5	4	9						1	2			1		2	2	1								2	1
Chisago	8	4	4	8			1	1				1		1	2	1		1							1		3
Clay	7	5	2	7				1	1			1		1	1			2						1		1	1
Clearwater																											
Cook	1		1	1												1											1
Cottonwood	7	3	4	7					2	1				1		1	2					1				1	1
Crow Wing	9	5	4	9			3			1						2	1	2						1	1	2	1
Brainerd	6	2	4	6			3									1	1	1						1		1	1
Dakota	13	5	8	13			2	2				2	1	3		2	1									1	2
Dodge	10	5	5	10				1	3			1	2			2	1									2	
Douglas	14	9	5	14			1	1		4	1	2	1		1	2		1							2	3	3
Faribault	14	8	6	14			1	1		2		1	2	2	3	1	1								1	3	4
Fillmore	24	18	16	24			1	3		2	3	5			4		1	5				1			2	2	6
Freeborn	20	11	9	20			3		1	3		5	4	1		2		1							1	4	4
Albert Lea	7	3	4	7			1		1	1		2	2													2	3
Goodhue	18	9	9	18			1	2		2		4	2	2	2		1	2								3	4
Red Wing	5	2	3	5						1		2						2								3	
Grant	2	1	1	2			1			1										1							
Hennepin	206	94	112	205	1		17	18	18	22	18	13	22	20	13	14	18	13				3	1	10	26	39	52
Minneapolis	190	92	98	189	1		17	15	16	22	17	12	20	18	11	14	17	11				3	1	5	20	36	48
Houston	8	5	3	8			2			1	2		1	1	1											2	
Hubbard	2	2		2						1						1										1	1
Isanti	7	4	3	7			1					1	2	2	1												1
Itasca	3	2	1	3							1			1	1										1		
Jackson	14	9	5	14			1	1	1	2	1	1		1	1	3	1	1					1		1	2	2
Kanabec	3	1	2	3					1		1				1											2	
Kandiyohi	14	8	6	14				1	1	3	3	1	1		3	1						1			2	1	4
Kittson	4	2	2	4				1		1		1	1												1	1	

TABLE No. XXIVA—CANCER, ALL FORMS—1909—Continued

COUNTY	Age				Conjugal Cond.				Birth Place				Occupation														
	60 to 70	70 to 80	Over 80	Not Given	Single	Married	Wid. or Div'd	Not Given	Minn.	Other U. S.	Foreign	Not Given	None	Farmer	Laborer	Teacher	Teamster	Domestic	Mechanic	Metal worker	Wood-worker	Ry.	Merchant	Professional	Office	Mason	Miscellaneous
Aitkin	1	1	1			6			1	2	3		4	1							1						
Anoka	1	2				6	1		2	1	4		4	3													
Becker	5			1	1	5	2	1		1	7	1	2	6	1												
Beltrami			1		3		1			1	3		2		2												
Benton						2			1	1				2													
Big Stone	2					1	1			1	1		1	1													
Blue Earth	9	5	4		2	15	11	1	2	7	19	1	22	2		2	1				1		1				
Mankato	**7**	**3**	**1**		**2**	**9**	**8**		**1**	**5**	**13**		**13**	**1**		**2**	**1**				**1**		**1**				
Brown	5	3	2			6	5	1		1	11		11	1													
New Ulm	**4**	**2**	**2**			**4**	**4**	**1**			**9**		**9**														
Carlton	2	1				9			1	2	6		3	4	1			1									
Cloquet																											
Carver		3			3	8	1	1	3	2	8		7	4		1		1									
Cass	1					2	1		1	2			3														
Chippewa	3	2	1		3	6				2	7		3	5							1						
Chisago	1		3		2	4	2		1	2	5		5	3													
Clay	3	1			2	5			1	1	5		3	4													
Clearwater																											
Cook						1					1		1														
Cottonwood	2	1	1		1	6			1		6		5										1	1			
Crow Wing	2	2			1	6	1	1	1	1	4	3	7	2													
Brainerd	**1**	**2**				**5**	**1**		**1**		**2**	**3**	**6**														
Dakota	4	5	1			8	5			3	10		11	1	1												
Dodge	4	4			2	5	11	1		4	5	1	5	2	1								1	1			
Douglas	3	2	1		3	9	2		2	3	9		6	4	1	1					1		1				
Faribault	2	3	1		3	6	3	2		8	5	1	9	4			1										
Fillmore	5	7	1		5	13	6		3	3	17	1	11	10	1								1				1
Freeborn	2	4	4	1	1	8	9	2	3	6	11		9	10			1										
Albert Lea	**1**	**1**				**4**	**3**			**3**	**4**		**4**	**2**			**1**										
Goodhue	6	4	1		1	13	4			4	14		1	2	3						1				1		
Red Wing		**2**				**4**	**1**			**1**	**4**		**4**	**1**													
Grant	1				1	1					2		1	1													
Hennepin	39	29	16	1	25	120	46	15	31	71	98	6	142	13	11	4	2	1	6	1	5		9	2	4		6
Minneapolis	**36**	**29**	**11**	**1**	**24**	**111**	**43**	**12**	**24**	**71**	**89**	**6**	**128**	**13**	**11**	**4**	**2**	**1**	**4**	**1**	**5**		**9**	**2**	**4**		**6**
Houston		6			1	4	1	2	2	1	5		2	4	7												
Hubbard						1	1			2				1	1												
Isanti	2	2	2		1	5	1		4		3		3	3													1
Itasca	1	1				1	1	1		2		1	1	1	1												
Jackson	6	1	1		1	11	2		2	6	6		8	3							1		1		1		
Kanabec	1					3				1	2		2	1													
Kandiyohi	4	1	1		2	9	3		2	1	11		7	4									2		1		
Kittson	2					4					4		2	2													

TABLE No. XXIVA—CANCER, ALL FORMS—1909—Continued

COUNTY	Total	Sex		Color			Date of Death												Age								
		Male	Female	White	Black	Other Color	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Under One	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60
Koochiching	3	2	1	3										2			1									3	
Lac Qui Parle	4	4		4							1		2			1										1	
Lake	1		1	1					1																		
Le Sueur	7	1	6	7				2	1	1		2		1												2	
Lincoln	1	1		1			1																				
Lyon	9	4	5	9			1	2			1		1	1	1		1	1									3
McLeod	11	4	9	11			2	2		2			2	1		1	1					1			1		6
Mahnomen																											
Marshall	17	7	10	17					2	2	1	3	1	2	3	1	1	1						1	1	1	6
Martin	4	3	1	4					1					1	2											2	
Meeker	9	4	5	9						3	2		1	1		1		1							2		3
Mille Lacs	3	2	1	3				1				1		1											2	1	
Morrison	8	6	2	8			3						1	1		1		2									2
Little Falls	4	2	2	4			1						1	1		1											
Mower	15	6	9	15			1	1	4	1				1	2		3	2						3			2
Austin	2		2	2											1			1						1			
Murray	7	3	4	7			2		1		1	1	1	1													
Nicollet	8	4	4	8			3		2	1					2												
St. Peter	1		1	1											1												
Nobles	8	4	4	8					1		1	1	2			1		2									1
Norman	3	2	1	3					2				1														3
Olmsted	59	35	24	59			4	2	6	4	9	8	6	4	5	5	3	3			1		1	1	5	11	20
Rochester	47	28	19	47			2	1	4	3	9	7	5	4	4	4	3	1			1		1	1	5	9	18
Otter Tail	31	14	17	31			3	5	4	3	1	1	2	1	2	3	4	2		1					1	8	8
Fergus Falls	8	2	6	8			2		1		1	1	1		1		1			1						2	3
Pine	9	5	4	9						2		1		3		2		1								2	3
Pipestone	6	3	3	6			1			1			1	2	1											1	3
Polk	20	6	14	20			1		1	3	1	1	2	2	3	2	3	1							3	3	7
Crookston	6	3	3	6					1			1	1	2	1										1	1	3
Pope	9	6	3	9			2	1	2			1		1	2				1							1	4
Ramsey	147	71	76	146	1		14	7	20	11	7	10	12	10	20	12	10	14					2	4	13	23	48
St. Paul	142	68	74	141	1		14	7	20	11	7	9	11	10	20	11	10	13					2	4	11	23	48
Red Lake	6	3	3	6				1			1			3	1									1		1	1
Redwood	5	3	2	5										1	2			2							1		1
Renville	16	8	8	16			1	1	1		1	1	1	1	3	2	2	2			1					1	3
Rice	22	14	8	22			2	1	4		1	1	3	2	3	4		1							1		2
Faribault	8	4	4	8			1	1	1				1	1	2	1									1		
Rock	1		1	1														1									
Roseau	4	4		4				1	1	1		1							1							1	
St. Louis	64	33	31	63	1		6	7	2	3	7	5	7	6	5	3	4	9					2	1	12	18	16
Duluth	49	26	23	48	1		4	5	1	3	4	3	5	6	4	3	4	8					2	1	8	14	12

TABLE No. XXIVA—CANCER, ALL FORMS—1909—Continued

COUNTY	Age				Conjugal Cond.				Birth Place				Occupation														
	60 to 70	70 to 80	Over 80	Not Given	Single	Married	Wid. or Div'd	Not Given	Minn.	Other U. S.	Foreign	Not Given	None	Farmer	Laborer	Teacher	Teamster	Domestic	Mechanic	Metal worker	Wood-worker	Ry.	Merchant	Professional	Office	Mason	Miscellaneous
Koochiching					2	1					3		1								2						
Lac Qui Parle	2	1			1	2	1				3	1	1	3													
Lake	1						1				1		1														
Le Sueur	2	1	2			6	1			1	4	2	5	1	1												
Lincoln	1					1					1			1													
Lyon	3	1	2		1	4	3	1		3	6		5	3													2
McLeod	2	1			1	4	6		1	2	8		8	1													1
Mahnomen																											
Marshall	7	1				7	9	1	1	3	13		11	4	1								1				
Martin		1	1			1	3			1	3		1	3													
Meeker		4			1	6	2			2	7		6	3													
Mille Lacs						2	1		2		1		1	1													1
Morrison	2	2	2			8					8		3	4							1						
Little Falls	1	2	1			4					4		2	1							1						
Mower	3	6	1		1	11	3		2	3	9	1	8	5	1			1									
Austin		1			1	1			1	1			2														
Murray	3	4				4	3			2	4	1	4	3													
Nicollet	4	4				5	3			1	7		5	3													
St. Peter		1				1					1		1														
Nobles	5	2				6	2			1	7		5	3													
Norman						2	1			1	2		1	2													
Olmsted	12	5	3		7	40	10	2	2	2	21	30	6	27	18	2				1		3		5	1		2
Rochester	10	1	1		6	31	7	3	2	14	25	6	21	13	2				1		3		5				2
Otter Tail	7	5	1		6	20	5		2	7	16	6	18	10	1								1		1		
Fergus Falls	2				3	3	2			4	4		6		1								1				
Pine	3	1				6	2	1		3	6		7		1											1	
Pipestone	1	1				5	1		1	1	4		3	2							1						
Polk	4	3				17	2	1		2	18		15	3			1				1						
Crookston	1					6				2	4		4	1			1										
Pope	1	1	1		2	6	1		1	1	7		8				1										
Ramsey	31	20	6		21	90	30	6	9	50	86	2	100	9	4		11		5		1	1	3	1	6		6
St. Paul	29	19	6		21	85	30	6	7	49	84	2	98	6	4		11		5			1	3	1	6		6
Red Lake	2	1			2	4				1	5		5	1													
Redwood	1	2				3	2		1	3	1		2										1				2
Renville	5	5	1		1	13	1	1	1	1	13	1	10	6													
Rice	7	9	3		1	15	5	1		9	11	2	11	6			1		2				1				1
Faribault	5	2			1	4	2	1		2	5	1	6				1						1				
Rock	1						1				1		1														
Roseau	1	1			1	3			1		3		2	2													
St. Louis	10	4	1		9	45	8	2	3	14	46	1	39	6	7	3			3				1	1	2		2
Duluth	9	2	1		7	36	5	1	2	12	33	1	30	5	3	3			2				1	1	2		1

TABLE No. XXIVA—CANCER, ALL FORMS—1909—Continued

COUNTY	Total	Sex		Color			Date of Death												Age								
		Male	Female	White	Black	Other Color	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Under One	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60
Eveleth	1	1		1														1							1		
Hibbing	1		1	1							1														1		
Virginia	4	3	1	4			1	1	2																	1	2
Scott	2	2		2						1	1																1
Sherburne	3	2	1	3								2	1											1			1
Sibley	10	7	3	10				3							1	1	3	2			1		1				1
Stearns	24	9	15	24			1	2	2	2	1	2	1	1	5	3		4					1	1		3	7
St. Cloud	10	3	7	10				1		1		2		1		2		3								1	3
Steele	9	5	4	9			3	1	2	2					1									1	1	3	
Owatonna	3	1	2	3			2		1															1		1	
Stevens	5	5		5					2			1				2							1	1		1	2
Swift	8	6	2	8			1				1			1	2	2		1							1	1	4
Todd	17	8	9	17			1	1	2		2	2	1	3	1	1	2	1				1	1		1	2	1
Traverse	5	3	2	5				1	1		1			1		1										1	
Wabasha	14	8	6	14			1	1	4	1	3	1		2			1						1		1	3	2
Wadena	7	4	3	7			1	1	1		1	2		1											1	1	3
Waseca	10	6	4	10						1	1	3		1	1	2		1							1	1	3
Washington	17	12	5	17			1	1		2	2	2	1	1	1		3	3					1		2	1	2
Stillwater	7	3	4	7			1				2	1			1		1	1							1	1	1
Watonwan	6	3	3	6				1	1			1	1				2								1		1
Wilkin	8	2	6	8			1	1		1		1		1			2	1							2	1	2
Winona	39	23	16	29			3	2	3	8	2	3	2	3	2	6	2	3			1			1		6	10
Winona	27	9	18	27			3	1		7	1	3	1	1	1	5	2	2								5	9
Wright	23	10	13	23			2		2	2	3	1	3	2	3	1	1	3		2		1		1	1	2	6
Yellow Medicine	6	2	4	6						1	1	1		1	2											2	2
Total	1243	633	610	1240	3		104	88	107	121	95	102	104	105	128	99	92	97	2	3	5	10	14	24	86	196	303

TABLE No. XXIVA—CANCER, ALL FORMS—1909—Continued

COUNTY	Age				Conjugal Cond.				Birth Place				Occupation														
	60 to 70	70 to 80	Over 80	Not Given	Single	Married	Wid. or Div'd	Not Given	Minn.	Other U. S.	Foreign	Not Given	None	Farmer	Laborer	Teacher	Teamster	Domestic	Mechanic	Metal worker	Wood-worker	Ry.	Merchant	Professional	Office	Mason	Miscellaneous
Eveleth	....	....	....	....	....	1	....	....	....	....	1	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....
Hibbing	....	....	....	....	....	1	....	....	....	1	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Virginia	....	1	....	....	....	2	1	1	....	1	3	....	1	1	1	....	....	....	1	....	....	....	....	....	....	....	....
Scott	1	....	....	....	1	1	....	....	....	....	2	....	....	1	....	....	....	....	....	....	....	....	....	1	....	....	....
Sherburne	1	....	....	....	....	2	1	....	1	1	1	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	1
Sibley	5	1	1	....	1	5	4	....	2	....	8	....	6	2	1	....	....	....	1	....	....	....	....	....	....	....	....
Stearns	5	7	....	....	2	14	7	1	4	9	11	....	18	5	....	....	....	....	....	....	....	....	....	1	....	....	....
St. Cloud	**3**	....	....	....	**1**	**5**	**3**	**1**	**6**	**4**	....	....	**7**	**2**	....	....	....	....	....	....	....	....	....	**1**	....	....	....
Steele	2	1	1	....	2	4	3	....	2	2	5	....	4	3	1	....	....	....	....	....	....	....	....	....	....	1	....
Watonwan	**1**	....	....	....	**1**	**1**	**1**	....	**1**	**1**	**1**	....	**2**	....	**1**	....	....	....	....	....	....	....	....	....	....	....	....
Stevens	....	....	....	....	2	3	....	....	2	1	2	....	2	3	....	....	....	....	....	....	....	....	....	....	....	....	....
Swift	2	....	....	....	....	8	....	....	....	1	7	....	3	5	....	....	....	....	....	....	....	....	....	....	....	....	....
Todd	7	4	....	....	2	12	3	....	5	1	11	....	6	4	....	....	....	....	....	....	....	....	2	....	....	....	5
Traverse	3	1	....	....	....	3	2	....	....	1	4	....	3	2	....	....	....	....	....	....	....	....	....	....	....	....	....
Wabasha	3	3	1	....	1	9	3	1	3	5	6	....	8	3	2	....	....	....	....	....	....	....	....	....	....	1	....
Wadena	2	....	....	....	1	3	3	....	1	3	3	....	6	....	....	....	....	....	....	....	....	....	....	....	1	....	....
Waseca	3	....	1	....	6	3	1	....	....	4	6	....	5	3	....	....	1	....	....	....	....	....	1	....	....	....	....
Washington	7	3	1	....	2	6	8	1	2	3	12	....	8	6	2	....	....	....	....	....	....	....	....	1	....	....	....
Stillwater	**2**	**1**	**1**	....	**1**	**2**	**4**	....	....	**3**	**4**	....	**4**	**2**	....	....	....	....	....	....	....	....	....	**1**	....	....	....
Watonwan	3	1	....	....	1	2	3	....	1	1	4	....	3	2	1	....	....	....	....	....	....	....	....	....	....	....	....
Wilkin	3	....	....	....	....	6	1	1	1	2	5	....	7	1	....	....	....	....	....	....	....	....	....	....	....	....	....
Winona	8	12	1	....	3	22	14	....	5	22	12	....	30	4	....	....	....	....	1	....	....	1	....	....	2	....	1
Winona	**4**	**8**	**1**	....	**1**	**15**	**10**	**1**	**1**	**7**	**19**	....	**22**	**1**	....	....	....	....	**1**	....	....	**1**	....	....	**1**	....	**1**
Wright	7	2	1	....	4	13	6	....	4	8	11	....	13	7	1	....	....	....	....	....	....	....	1	....	....	....	1
Yellow Medicine	1	1	....	....	....	6	....	....	....	1	5	....	3	3	....	....	....	....	....	....	....	....	....	....	....	....	....
Total	312	218	67	3	145	768	282	48	105	330	769	39	752	262	50	11	20	4	28	1	21	3	25	10	19	2	35

Note: Figures for cities over 5,000 population are printed in heavy faced type, but the same figures are included in the county line preceding.

TABLE No. XXIVB—CANCER, ALL FORMS—1909—Continued

COUNTY	Total	Sex		Color			Date of Death												Age								
		Male	Female	White	Black	Other Color	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Under One	1 to 2	2 to 5	5 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60
Form 1	43	33	10	43	....	....	3	4	6	7	....	3	1	6	4	3	3	3	....	....	1	....	....	....	1	4	9
Form 2	622	376	246	621	1	....	54	38	59	54	42	42	59	54	70	57	44	49	1	2	....	2	3	7	28	82	167
Form 3	132	69	63	132	....	....	11	5	8	12	15	19	10	16	8	9	10	9	....	....	....	....	....	5	9	32	32
Form 4	116	....	116	115	1	....	7	10	14	9	10	10	7	6	12	11	12	8	....	....	....	....	1	6	16	29	34
Form 5	71	....	71	71	....	....	6	8	8	4	6	5	7	9	5	6	5	2	....	....	....	....	....	....	16	18	15
Form 6	31	22	9	31	....	....	2	4	1	3	2	2	6	1	2	4	1	3	....	....	....	....	....	....	2	5	2
Form 7	228	133	95	227	1	....	21	19	11	32	20	21	14	14	27	9	17	23	1	1	4	8	10	6	14	26	44
Total	1243	633	610	1240	3	....	104	88	107	121	95	102	104	106	128	99	92	97	2	3	5	10	14	24	86	196	303

TABLE No. XXIVB—CANCER, ALL FORMS—1909—Continued

COUNTY	Age				Conjugal Cond.				Birth Place				Occupation														
	60 to 70	70 to 80	Over 80	Not Given	Single	Married	Wid. or Div'd	Not Given	Minn.	Other U. S.	Foreign	Not Given	None	Farmer	Laborer	Teacher	Teamster	Domestic	Mechanic	Metal worker	Wood-worker	Ry.	Merchant	Professional	Office	Mason	Miscellaneous
Form 1	13	6	9	....	5	24	13	1	4	10	27	2	22	9	2	2	1	....	2	1	1	1	....	....	....	....	2
Form 2	179	126	25	....	71	382	141	28	35	131	439	17	332	166	27	4	17	....	22	....	13	1	9	4	12	2	13
Form 3	34	16	4	....	10	88	29	5	12	33	83	4	72	34	7	1	1	....	1	....	2	....	9	....	1	....	4
Form 4	16	10	3	1	7	83	25	1	11	47	58	....	112	....	....	....	....	1	....	....	....	....	....	1	....	....	2
Form 5	14	6	2	....	8	45	18	....	8	28	30	5	66	....	....	....	....	2	....	....	....	....	....	1	1	....	1
Form 6	5	12	5	....	3	20	7	1	3	11	17	....	15	6	3	1	....	....	....	....	2	1	2	....	....	....	1
Form 7	51	42	19	2	41	126	49	12	32	70	115	11	133	47	11	3	1	1	3	....	3	....	5	4	5	....	11
Total	312	218	67	3	145	768	282	48	105	330	769	39	752	262	50	11	20	4	28	1	21	3	25	10	19	2	35

Form 1—Cancer and other malignant tumors of the buccal cavity.
Form 2—Cancer and other malignant tumors of the stomach and liver.
Form 3—Cancer and other malignant tumors of the peritoneum, intestines and rectum.
Form 4—Cancer and other malignant tumors of the female genital organs.
Form 5—Cancer and other malignant tumors of the female breast.
Form 6—Cancer and other malignant tumors of the skin.
Form 7—Cancer and other malignant tumors of other organs and unspecified organs.

TRICHINOSIS.

Two deaths occurred from this disease in 1909, one in Minneapolis, the other in Nobles county. There were several cases of this disease reported from various parts of the state, but fortunately only these two deaths.

RABIES.

Two deaths from this disease occurred; one in 1908, one in 1909.

PUERPERAL SEPSIS.

This condition still keeps a place among the preventable diseases in Minnesota. In 1908 there were 117 deaths from this cause; in 1909, only 72 deaths. This shows a marked improvement. Of these deaths, 64 occurred among married women, 2 widowed or divorced, 5 single and 1 not stated.

SUMMARY.

Most of the preventable diseases referred to in the preceding pages will receive especial consideration in the report of the epidemiologist. It is to be hoped that the present legislature will make it possible for the State Board of Health to greatly improve its work along these lines during the coming years, and in addition will hold out such encouragement in the way of practical laws for rural districts, as well as for the municipalities, as to secure more rational methods in the control of preventable diseases.

DEATHS DUE TO VIOLENCE OR SUICIDE.

The records for 1909 show the following:

TABLE NO. XXV.

1909 Deaths due to External Causes.

Suicide—By poison	56
By asphyxiation	12
By hanging	64
By drowning	13
By firearms	76
By cutting instruments	28
By jumping	3
By crushing	1
Other suicides	5
Fractures	164
Burns and scalds	102
Sunstroke	20
Freezing	24
Electric shock	22
Poisonous gases (accidental)	19
Drowning (accidental)	165
Other acute poisoning	39
Gunshot wounds (accidental)	75
Injuries by machinery	16
Injuries in mines	37
Railroad accidents	216
Injuries by horses and vehicles	49
Suffocation	23
Injuries at birth	72
Other Accidental Tramnations	200
Burns from corrosive sublimate	1
Other external violence	31
Inanition and starvation	2
Homicide	48
Conflagrations	8
Automobile accidents	9
Street car accidents	7
Total	1,607

EMERGENCY WORK.

Previous to the forest fires, typhoid fever had prevailed in certain sections in the northern part of the state without any report being made of the fact to the State Board of Health, and without any apparent effort on the part of the local authorities to control the disease. With the destruction of the villages of Baudette and Spooner this condition of affairs was brought to our attention. Acting under the advice of Attorney General Simpson, who fortunately was at Spooner at the time, the State Board of Health, following the instructions given in section 2134, Revised Laws of 1905, took charge of sanitary matters at Baudette and established a hospital in which typhoid fever patients were cared for. Under the law this expense would have fallen upon the villages of Baudette and Spooner. However, it was borne by the Minnesota Red Cross relief committee. The report of Dr. George D. Haggard, who had charge of this hospital under the direction of the State Board of Health, will be found on page 242.

A DOG LICENSE.

Rabies continues almost in epidemic form in this state and it is strange that the citizens do not insist upon some form of control for dogs that may bring this disease to an end. Undoubtedly thousands of dollars have been lost during the last two years through the death of stock bitten by rabid dogs, and this, in conjunction with the treatment demanded of 529 human beings who have been bitten by rabid dogs should make everyone anxious to suppress the disease. The most positive means of suppression would be by the rigid enforcement of a muzzling law, but this would be a most difficult task. On the other hand, a license system would do much good, for it would authorize the destruction of unlicensed dogs, and thus reduce the number of homeless animals of this type roaming about the state. An excellent bill was introduced into the thirty-sixth legislature, but unfortunately the term "dog tax" was used. It is for the citizens of Minnesota through its legislative body to determine whether this disease is to be continued in this state.

VITAL STATISTICS.

The vital statistics of the state are not yet quite satisfactory. While every effort has been made since the passage of the "burial permit" law in 1907 to secure complete returns, certain individuals still neglect their duties, and as a result much correspondence is thrown upon the registrar's office in following up unreported birth and death records. Still further, the reports of deaths are often so incomplete or inaccurate as to require correspondence in order to secure the returns in such form as to make classification possible. The United States census bureau has recently issued a pamphlet on the "International List of Causes of Death," which it has sent to every registered physician in the state. This should be a means of further eliminating certain vague and indefinite causes of death still used to some extent by medical men. Under the present law, there should be no doubt as to the completeness of the records of deaths, for it is now illegal to bury the remains of any dead person until the death certificate, properly filled out, is in the hands of a registrar or his representative.

There is no such complete check on the reporting of births, but the law is sufficient to compel the reporting of these if the local officials will only enforce it. It is by no means uncommon for certain physicians to refuse to report births, because the state pays them nothing for so doing. Such action on the part of any physician is ill-advised. The state extends certain privileges to physicians, such as exemption from serving on juries, etc., and it has repeatedly been shown that in return for such privileges the state may demand a certain amount of service from physicians, such as the filling out of birth and death reports, without special compensation. Again, it is rather unbecoming in a professional man to refuse such a service because the state refuses to pay a fee, a fee which, if provided, would necessarily be ridiculously small. If a fee of 25 cents had been paid for the births and deaths reported in 1909 this would have entailed an expense of nearly $20,000. The fees to which any physician would have been entitled would have been of but slight financial benefit to him, while the effort to secure such an appropriation from the past legislatures, judging from their action relating to other matters that concern the public health among human beings, would have been fruitless. It should be understood that the records of births and deaths are of great value as legal documents, not simply for statistical purposes; and parents should insist upon having the records of births for their children complete. A record of birth is not complete without the full name of the child. If, therefore, the child was not named when the physician or midwife sent in the return of birth, the parents should see to it that the name of the child is sent on the supplemental blank furnished for that purpose to the proper official at the earliest possible date.

The attached chart shows how the birth and death records have kept pace with the increase in population of the state. There is shown a slight increase in the death rate. This may be due either to the fact that the population is becoming more permanent and is not made up so largely of healthy adult new settlers, or it may be due to more complete returns. The first seems the most probable.

The records for 1900 to 1909, inclusive, show a death rate per 1,000 population for the entire state and for the large cities as follows:*

Year.	State.	Minneapolis.	St. Paul.	Duluth.
1900	9.8	12.34	11.24	15.48
1901	9.5	13.07	11.33	13.81
1902	9.1	11.53	11.24	13.81
1903	9.5	11.72	10.93	16.17
1904	9.8	11.04	10.42	12.28
1905	9.5	10.61	11.26	14.15
1906	9.8	11.74	11.66	14.93
1907	10.1	11.81	12.01	14.40
1908	11.0	11.94	11.63	15.93
1909	10.8	12.08	12.28	17.21

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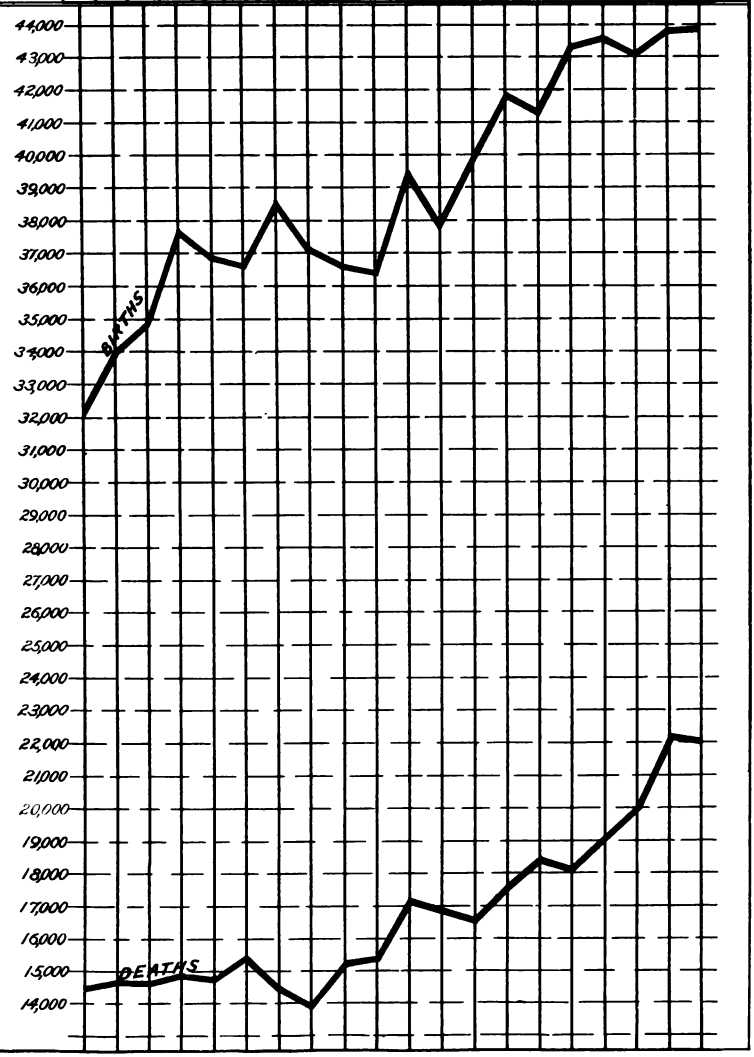
*Stillbirths are included in the computations on which these rates are based.

TOTAL BIRTHS AND DEATHS BY YEARS 1890-1909 INCLUSIVE

POPULATION	1301,826	1,356,385	1,410,944	1,465,503	1,520,062	1,574,619	1,609,974	1,645,349	1,680,704	1,716,059	1,751,395	1783,826	1816,257	1,848,688	1881,119	1,913,550	1,945,981	1,978,412	2,010,843	2,043274
YEAR	1890	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909
BIRTHS	32,197	34,006	34,967	37,728	36,935	36,618	38,588	37,144	36,604	36,342	39,531	37,962	39,980	41,943	41,365	43,415	43,694	43,096	43,963	43,950
DEATHS	14,492	14714	14673	14,969	14,868	15,418	14,462	13,945	15,279	15,340	17,236	16,927	16,606	17,629	18,492	18,114	19,118	20,043	22,202	22,003



It is fair to assume that the death rate for the entire state should be less than for the larger cities. It is also fair to assume that the records for the larger cities are accurate. It would therefore seem that the records for the entire state are comparatively accurate.

The laws relating to the collection of birth records have not been changed materially for some years. It is therefore interesting to note the attached record showing the birth rate for the larger municipalities of the state and for the entire state during the past ten years.

The attached table giving birth rate in cities of over 5,000 population for a period of ten years is interesting.

TABLE NO. XVII

Birth Rate in Cities over 5,000 Population

		1900	1901	1902	1903	1904	1905	1906	1907	1908	1909
Mankato	Population	10,599	10,576	10,553	10,530	10,506	10,482	10,459	10,436	10,412	10,389
	Births	211	234	211	259	223	235	233	244	219	202
	Rate	19.1	22.1	20.0	24.6	21.2	22.3	22.1	23.4	21.05	19.4
New Ulm	Population	5,403	5,427	5,451	5,475	5,500	5,525	5,550	5,574	5,598	5,623
	Births	141	160	171	159	143	148	130	162	116	144
	Rate	26.1	29.4	31.3	29.06	26.0	26.8	23.4	29.08	20.7	25.6
Cloquet	Population	3,072	3,468	3,864	4,260	4,656	5,052	5,448	5,844	6,240	6,636
	Births	128	121	141	160	143	200	204	219	216	240
	Rate	41.6	34.9	36.5	37.5	30.7	39.6	37.5	37.5	34.6	36.2
Brainerd	Population	7,524	7,625	7,725	7,825	7,925	8,025	8,125	8,225	8,325	8,425
	Births	140	139	190	193	180	126	141	177	224	210
	Rate	18.6	18.2	24.6	24.7	22.7	15.7	17.3	21.5	26.9	24.9
Albert Lea	Population	4,500	4,669	4,838	5,007	5,176	5,345	5,514	5,683	5,852	6,021
	Births	112	96	121	126	92	129	115	101	101	92
	Rate	24.9	20.6	25.0	25.2	17.8	24.2	20.9	17.8	17.3	15.3
Red Wing	Population	7,525	7,677	7,829	7,981	8,133	8,285	8,437	8,589	8,741	8,893
	Births	168	164	160	149	149	124	144	157	166	162
	Rate	22.3	21.4	20.5	18.7	18.3	15.0	17.1	18.3	19.0	18.2
Minneapolis	Population	202,714	212,583	222,452	232,316	242,180	252,044	261,908	271,772	281,636	291,500
	Births	4,261	4,112	4,226	4,271	4,298	4,502	4,951	5,431	5,366	5,791
	Rate	21.0	19.3	19.0	18.4	17.7	17.9	18.9	20.0	19.1	19.9
Little Falls	Population	5,774	5,804	5,834	5,864	5,894	5,924	5,954	5,984	6,014	6,044
	Births	153	143	184	173	169	169	134	168	141	129
	Rate	26.5	24.6	31.5	29.5	28.7	28.5	22.5	28.1	23.4	31.3
Austin	Population	5,474	5,622	5,770	5,919	6,068	6,217	6,366	6,514	6,662	6,811
	Births	77	90	97	108	117	137	122	144	153	138
	Rate	14.1	16.0	16.8	18.3	19.3	22.1	19.2	22.1	23.0	20.3
Rochester	Population	6,843	6,943	7,043	7,143	7,243	7,343	7,443	7,543	7,643	7,743
	Births	129	107	89	106	110	123	114	115	112	131
	Rate	18.8	15.4	12.6	14.8	15.2	16.8	15.5	15.6	14.7	16.9
Fergus Falls	Population	6,072	6,153	6,234	6,316	6,398	6,479	6,560	6,642	6,724	6,805
	Births	86	72	76	106	105	102	113	124	126	117
	Rate	14.1	11.7	12.2	16.8	16.4	15.8	17.2	18.7	18.7	17.2

Crookston	Population	5,359	5,579	5,799	6,019	6,239	6,459	6,679	6,899	7,119	7,339
	Births	111	104	134	146	135	151	157	234	181	187
	Rate	20.7	18.7	23.1	24.2	21.7	23.4	23.5	34.0	25.5	25.5
St. Paul	Population	163,065	168,233	173,401	178,569	183,737	188,895	194,063	199,231	204,399	209,567
	Births	3,279	3,241	3,358	3,511	3,511	3,605	3,885	4,161	4,116	4,105
	Rate	20.1	20.0	19.4	19.7	19.1	19.1	20.0	20.8	20.1	19.6
Faribault	Population	7,868	7,981	8,094	8,207	8,320	8,433	8,546	8,659	8,772	8,885
	Births	139	157	151	139	148	149	177	140	157	167
	Rate	17.7	19.7	18.7	16.9	17.8	17.7	20.7	16.2	17.9	18.8
Duluth	Population	52,969	55,519	58,069	60,619	63,169	65,719	68,269	70,819	73,369	75,919
	Births	1,112	1,063	1,244	1,333	1,456	1,381	1,526	1,734	1,736	1,854
	Rate	21.0	19.1	21.5	22.0	23.0	21.0	22.4	24.5	23.6	24.4
Hibbing	Population	2,481	3,116	3,751	4,386	5,021	5,656	6,291	6,926	7,561	8,196
	Births	81	148	154	227	254	230	302	327	347	356
	Rate	32.6	47.4	41.1	51.8	50.6	40.7	48.0	47.3	46.1	43.5
Virginia	Population	2,962	3,713	4,464	5,215	5,966	6,717	7,468	8,219	8,970	9,721
	Births	4	10	28	109	124	169	142	152	327	320
	Rate	1.6	2.7	6.3	20.9	20.8	25.2	19.0	18.5	36.5	32.9
St. Cloud	Population	8,663	8,857	9,051	9,245	9,439	9,633	9,827	10,021	10,215	10,409
	Births	227	211	171	207	197	289	243	241	255	247
	Rate	26.2	23.8	18.9	22.4	20.9	30.0	24.7	24.0	24.9	23.7
Owatonna	Population	5,561	5,571	5,581	5,591	5,601	5,611	5,621	5,631	5,640	5,650
	Births	91	94	98	87	118	92	113	112	100	103
	Rate	16.4	16.9	17.5	15.5	21.1	16.4	20.1	19.9	17.5	18.2
Stillwater	Population	12,318	12,106	11,894	11,682	11,470	11,258	11,046	10,834	10,622	10,410
	Births	218	182	197	223	192	172	184	160	159	144
	Rate	17.7	15.0	16.5	19.1	16.7	15.3	15.4	14.8	15.0	13.8
Winona	Population	19,714	19,601	19,488	19,375	19,262	19,149	19,036	18,923	18,810	18,697
	Births	465	465	481	496	460	461	458	411	424	410
	Rate	23.6	23.3	24.7	25.6	23.9	24.1	24.1	21.7	22.5	21.9
State	Population	1,751,395	1,783,826	1,816,257	1,848,688	1,881,119	1,913,550	1,945,981	1,978,412	2,010,843	2,043,274
	Births	39,531	37,962	39,980	41,943	41,365	43,415	43,694	43,096	43,963	43,950
	Rate	22.6	21.3	22.0	22.7	22.0	22.7	22.5	21.8	21.9	21.5

Note: The rate is figured on each 1,000 population.

FINANCIAL STATEMENT.

The following financial statements were submitted to the Board at the July meetings 1909 and 1910.

The expenses for the vital statistics, and also for the engineering division, exceeded the special appropriations made, and the excess had to be borne by the general fund, thus crippling the work of the Board to that extent. The appropriations and expenditures for these two divisions for the fiscal years ending July 31, 1909, and July 31, 1910, are as follows:

	1908-1909		1909-1910	
	Appropriation.	Expenditures.	Appropriation.	Expenditures.
Vital statistics..........	$3,500.00	$6,959.24	$3,500.00	$6,639.89
Engineering	1,000.00	1,125.94	2,500.00	3,071.75

FINANCIAL STATEMENT AUGUST 1, 1908, TO JULY 1, 1909.

STATE BOARD OF HEALTH FUND.

RECEIPTS.

Balance	$6.32	
Annual appropriation	11,000.00	
Special appropriation	3,000.00	
Embalmers and rendering licenses..........................	150.00	
Reimbursement for antitoxin...............................	68.60	
Sale of typewriter...	40.00	
Freight refund	24.60	
Branch laboratory	300.00	
Township lists	325.00	
		$14,914.52

DISBURSEMENTS.

July, 1908, expenses (part)..................................	$416.74	
August, 1908, expenses..	1,192.44	
September, 1908, expenses..................................	1,171.98	
October, 1908, expenses..	1,076.82	
November, 1908, expenses..................................	1,200.42	
December, 1908, expenses..................................	1,169.76	
January, 1909, expenses......................................	1,943.48	
February, 1909, expenses....................................	1,730.49	
March, 1909, expenses..	1,372.90	
April, 1909, expenses..	740.97	
May, 1909, expenses..	1,050.88	
June, 1909, expenses..	912.81	
		13,979.69
Balance July 1, 1909..................................		$934.83

VITAL STATISTICS FUND.

RECEIPTS.

Annual appropriations	$1,500.00	
Special appropriation	2,000.00	
		$3,500.00

DISBURSEMENTS.

July, 1908, expenses..	$269.78
August, 1908, expenses..	638.32
September, 1908, expenses..................................	368.69
October, 1908, expenses..	220.06
November, 1908, expenses..................................	....
December, 1908, expenses..................................	....
January, 1909, expenses......................................	....

February, 1909, expenses	....	
March, 1909, expenses	....	
April, 1909, expenses	366.62	
May, 1909, expenses	442.66	
June, 1909, expenses	443.51	
		2,752.39
Balance July 1, 1909		$747.61

COMMUNICABLE DISEASE FUND.

RECEIPTS.

Annual appropriations	$2,500.00	
Special appropriation	2,000.00	
		$4,500.00

DISBURSEMENTS.

July, 1909, expenses	$269.78	
August, 1908, expenses	286.38	
September, 1908, expenses	509.10	
October, 1908, expenses	440.97	
November, 1908, expenses	398.65	
December, 1908, expenses	403.83	
January, 1909, expenses	191.29	
February, 1909, expenses	....	
March, 1909, expenses	....	
April, 1909, expenses	576.73	
May, 1909, expenses	585.17	
June, 1909, expenses	389.54	
		4,051.44
Balance July 1, 1909		$448.56

LABORATORY FUND.

RECEIPTS.

Balance	$83.61	
Annual appropriations	13,000.00	
Special appropriations	2,500.00	
Branch laboratory	550.00	
Pasteur treatments	200.00	
		$16,333.61

DISBURSEMENTS.

August, 1908, expenses	$1,179.02	
September, 1908, expenses	1,197.88	
October, 1908, expenses	1,732.42	
November, 1908, expenses	1,414.72	
December, 1908, expenses	1,324.14	
January, 1909, expenses	1,401.17	
February, 1909, expenses	1,326.79	
March, 1909, expenses	1,238.87	
April, 1909, expenses	1,282.26	
May, 1909, expenses	1,155.22	
June, 1909, expenses	1,389.53	
		14,642.02
Balance July 1, 1909		$1,691.59

EMBALMING FLUID FUND.

RECEIPTS.

Balance	$359.67	
Appropriation	500.00	
		$859.67

DISBURSEMENTS.

August, 1908, expenses	$59.27	
September, 1908, expenses	12.88	
October, 1908, expenses	4.50	
November, 1908, expenses	....	
January, 1909, expenses	3.75	
February, 1909, expenses	....	
March, 1909, expenses	....	
April, 1909, expenses	....	
May, 1909, expenses	....	
June, 1909, expenses	....	
		79.40
Balance July 1, 1909		$780.27

PASTEUR INSTITUTE FUND.

RECEIPTS.

Balance	$251.23	
Appropriation	5,000.00	
Pasteur treatments	100.00	
		$5,351.23

DISBURSEMENTS.

August, 1908, expenses	$358.82	
September, 1908, expenses	365.68	
October, 1908, expenses	385.41	
November, 1908, expenses	339.14	
December, 1908, expenses	392.58	
January, 1909, expenses	370.19	
February, 1909, expenses	315.09	
March, 1909, expenses	321.73	
April, 1909, expenses	365.42	
May, 1909, expenses	322.96	
June, 1909, expenses	343.79	
		3,880.81
Balance July 1, 1909		$1,470.42

SANITARY ENGINEERING FUND.

RECEIPTS.

Appropriation		$1,000.00

DISBURSEMENTS.

July, 1908, expenses (part)	$180.03	
August, 1908, expenses	230.62	
September, 1908, expenses	84.78	
October, 1908, expenses	60.58	
December, 1908, expenses	112.10	
January, 1909, expenses	64.64	
February, 1909, expenses	59.19	
March, 1909, expenses	58.55	
April, 1909, expenses	63.11	
May, 1909, expenses	50.00	
June, 1909, expenses	....	
		963.60
Balance July 1, 1909		$36.40

FINANCIAL STATEMENT AUGUST 1, 1909, TO JULY 1, 1910.

STATE BOARD OF HEALTH FUND.

RECEIPTS.

Balance	$105.74	
Annual appropriation	14,500.00	
Rendering license renewals	105.00	
Township lists	15.00	
Embalmers' licenses	248.00	
		$14,973.74

DISBURSEMENTS.

August, 1909	$1,021.86	
September, 1909	1,012.64	
October, 1909	950.02	
November, 1909	1,015.26	
December, 1909	1,016.78	
January, 1910	943.88	
February, 1910	1,081.84	
March, 1910	1,485.00	
April, 1910	1,500.95	
May, 1910	1,511.87	
June, 1910	1,956.98	
		13,497.08
Balance July 1, 1910		$1,476.66

VITAL STATISTICS FUND.

RECEIPTS.

Balance	$126.69	
Annual appropriation	3,500.00	
		$3,626.69

DISBURSEMENTS.

August, 1909	$651.05	
September, 1909	573.66	
October, 1909	540.16	
November, 1909	384.75	
December, 1909	508.12	
January, 1910	518.48	
February, 1910	449.57	
March, 1910	....	
April, 1910	....	
May, 1910	....	
June, 1910	....	
		3,626.69
Balance July 1, 1910		....

The March, April, May and June expenses were paid out of the general fund.

COMMUNICABLE DISEASE FUND.

RECEIPTS.

Balance	$128.26	
Annual appropriation	9,500.00	
Refund overpayment for printing	28.50	
		$9,656.76

DISBURSEMENTS.

August, 1909	$582.33	
September, 1909	942.07	
October, 1909	988.67	
November, 1909	796.69	
December, 1909	789.58	
January, 1910	1,024.09	
February, 1910	947.61	
March, 1910	702.64	
April, 1910	1,120.89	
May, 1910	977.17	
June, 1910	605.46	
		9,477.20
Balance July 1, 1910		$179.56

LABORATORY FUND.

RECEIPTS.

Balance	$188.77	
Appropriation (annual)	13,000.00	
		$13,188.77

DISBURSEMENTS.

August, 1909	$962.57	
September, 1909	1,207.32	
October, 1909	1,575.84	
November, 1909	1,036.54	
December, 1909	1,150.91	
January, 1910	1,149.97	
February, 1910	1,122.40	
March, 1910	956.14	
April, 1910	956.96	
May, 1910	958.27	
June, 1910	1,387.97	
		12,464.89
Balance July 1, 1910		$723.88

BRANCH LABORATORY FUND.

RECEIPTS.

Annual appropriation	$3,000.00	
Duluth City aid	325.00	
St. Louis County aid	550.00	
		$3,875.00

DISBURSEMENTS.

August, 1909	$232.19	
September, 1909	162.37	
October, 1909	242.44	
November, 1909	172.87	
December, 1909	240.06	
January, 1910	181.35	
February, 1910	229.94	
March, 1910	166.91	
April, 1910	192.32	
May, 1910	166.27	
June, 1910	273.85	
		2,260.57
Balance July 1, 1910		$1,614.43

EMBALMING FLUID FUND.

RECEIPTS.

Balance		$779.27

DISBURSEMENTS.

August, 1909	....	
September, 1909	....	
October, 1909	$70.00	
November, 1909	70.00	
December, 1909	70.00	
January, 1910	80.50	
February, 1910	80.00	
March, 1910	90.37	
April, 1910	80.00	
May, 1910	84.50	
June, 1910	80.00	
		705.37
Balance July 1, 1910		$73.90

PASTEUR INSTITUTE FUND.

RECEIPTS.

Balance	$594.55	
Annual appropriations	7,500.00	
Refund on fire insurance policy	105.00	
Pasteur treatments	300.00	
		$8,499.55

DISBURSEMENTS.

August, 1909	$593.13	
September, 1909	572.00	
October, 1909	932.98	
November, 1909	488.08	
December, 1909	509.02	
January, 1910	562.54	
February, 1910	492.64	
March, 1910	509.54	
April, 1910	424.54	
May, 1910	465.48	
June, 1910	405.53	
		5,955.48
Balance July 1, 1910		$2,544.07

SANITARY ENGINEERING FUND.

RECEIPTS.

Balance	$13.33	
Annual appropriation	2,500.00	
		$2,513.33

DISBURSEMENTS.

August, 1909	$354.14	
September, 1909	385.93	
October, 1909	247.08	
November, 1909	360.02	
December, 1909	259.33	
January, 1910	183.77	
February, 1910	188.62	
March, 1910	137.05	
April, 1910	183.13	
May, 1910	126.15	
June, 1910	87.68	
		2,512.88
Balance July 1, 1910		$0.45

Expenses for June, amounting to $246.02, were paid out of general fund.

MEDICAL INSPECTION OF SCHOOLS.

The state is under obligation to see that its children shall not only be protected from disease while attending school, but shall also be so directed that they may grow up into healthy citizens. To bring this about, there should be trained sanitarians charged with the duties of medical school inspection.

The medical inspection of schools presents itself to the public from two view-points: First, the prevention of infectious diseases; second, the general protection of the health of school children and teachers. The first of these gives immediate benefit to the community and the school, and has an important place not only in preventing diseases, but also in avoiding to a great extent the exclusion of children from school on account of preventable diseases. The second has to do with the raising of the standard of public health and improving the methods of education. In the exclusion of children suffering from infectious diseases the medical school inspector has a minor responsibility, but he has a very wide field of operation in raising the general standard of the health of those attending school.

Great Britain probably has the best organized system of medical school inspection at the present time, and this is due to the fact that this country is well equipped with men trained in public health work who give their whole time to general sanitation. They are not subject to temporary appointments, but are practically on a civil service basis.

It is high time that Minnesota were taking up this line of work, both for its influence on preventive medicine and for its influence on the future good of the citizens of the state. The history of school inspection abroad should be of some service to Minnesota in determining the methods to be followed here.*

"**The School Hygiene Movement Abroad.** In the period between 1840 and 1865 there was little sign that the new movement was gaining ground, but in the latter year the report of the School Commission in Norway did something to bring the importance of school hygiene once more before the general public, and in 1866 Hermann Cohn undertook his classic researches into the eyesight of over 10,000 children at Breslau. In 1883 Cohn strongly recommended on general grounds as well as from the point of view of an oculist, the appointment of school doctors. The demands made by Cohn were supported by the eminent authority of Virchow and others, who formulated on more general lines the problem of the health of school children and the need for a school doctor. Baron von Manteuffel, while governor of Alsace-Lorraine, appointed a commission to inquire into the condition of the schools in the province. The report of this commission was issued in 1882, and contained recommendations aiming at the efficient inspection of school buildings by medical officers and the general improvement of the fabric and equipment of schools. In the same year researches were instituted into the health of 30,000 school children in Denmark, and thence forward civilized governments began to recognize a certain responsibility in the matter, even though progress was somewhat tentative. In 1883 the first school doctor in Germany, at Frankfurt-am-main, was appointed, and in 1885 a similar officer was appointed at Lausanne, while in 1888 investigations were conducted by the government into the physical condition of over 11,000 children in Sweden. In the same decade medical inspection of schools was instituted for all the departments of France, and in 1896 the system obtaining in Paris was thoroughly reorganized. Finally, six school physicians were appointed in 1895 to supervise the elementary schools in Moscow, and the Russian minister of education is now advised by a medical department at headquarters.

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*Following this I quote quite freely from the report for 1908 of Dr. George Newman, Chief Medical Officer of the Board of Education, England.

"The Wiesbaden system marks the introduction of a new conception and understanding of the problem. This system, which has been widely adopted in Germany, treats the child as the center of interest and his wellbeing as the end of reform, to which even the most satisfactory school environment is only a means. Under this system school doctors were appointed at Wiesbaden in 1896, while in 1898 the Prussian government urged its adoption wherever the local conditions were at all similar, with the result that throughout the German empire a large number of school doctors have been appointed, and some 350 towns and communities have undertaken in a greater or less degree the work of medical supervision of schools.

"**The School Hygiene Movement in England.** In the meantime the growth of the movement in England had been proceeding steadily, if not rapidly. In November, 1880, Dr. Priestley Smith, of Birmingham, published his address on 'Short Sight in Relation to Education,' which was founded upon his examination of about 2,000 school children and training college students in the town. Dr. Clement Dukes, the medical officer at Rugby School, published his work on 'Health at School' in 1882. In 1884 Doctor (now Sir) J. Crichton Browne issued his report to the educational department, insisting strongly on the mental over-pressure which he believed to exist in the public elementary schools of London. In 1892 Dr. Francis Warner wrote a report of the examination of 50,000 scholars in schools of various types. Sir Shirley Murphy, and other medical officers of health had also drawn attention to the occurance of infectious disease in relation to school attendance. In 1890 a medical officer (Dr. W. R. Smith) was appointed by the London school board, and in 1893 this example was followed by the Bradford school board, who appointed Dr. James Kerr, and thus initiated a medical administration which has been of marked and continuous excellence. In 1902 Dr. Kerr succeeded Dr. Smith in London. It was, of course, to be expected that the energy shown by these local bodies would be but a prelude to state action, and that when such action was taken it would follow more or less uniform lines, and would be supplementary to, and a development of, what had gone before rather than an entirely new creation.

"**The Need for Medical Inspection.** In 103 the royal commission on physical training (Scotland) issued a report which is of the greatest interest from the point of view of the history of medical inspection. The first part of this report contains a review of the then existing arrangements for physical training for all types of student and proposals for modifying the curricula of elementary and secondary schools to meet the need for physical exercises. In the second part there were included certain suggestions as to medical inspection and the feeding of school children, which had a more or less direct influence on subsequent legislation in England. The commission furnished a considerable body of facts revealing the extent and degree of physical defect and disability in the child population of Scotland, and pointed out that the difficulty they themselves had experienced in obtaining full and satisfactory data as to physical condition had convinced them that though medical inspection was necessary 'mainly for remedial objects, it was also necessary in order to make available information of the highest value both for ascertaining the facts of national physique and the means that may be adopted for its improvement, or for retarding such degeneration as may be in progress.' The commissioners therefore held that school boards should avail themselves of the assistance of medical officers not only to undertake duties as to school hygiene and sanitation, but also as to the medical inspection of school children.

"In 1904 there followed the report of the interdepartmental committee on physical deterioration, which dealt with the wider question of which the health and physical condition of school children formed but a part. This committee revealed in its evidence the existence in many classes of the community of a marked degree of physical unfitness, if not of deterioration. In regard to school hygiene, though the committee recorded their opinion that 'the general effects of school life are not prejudicial to health, they drew attention to the need for improvement in lighting, ventilation and the seating arrangements at schools, and they went on to state their sense of the importance of 'methodical physical training,' citing in this connection the Physical Exercises Syllabus of 1904, which had just been issued by the board of education. Furthermore, the committee stated: 'There is need of a much more complete system of medical inspection of schools than has yet been attempted.' They therefore recommended that 'a systematized medical inspection of school children should be imposed as a public duty on every school authority,' though they suggested that 'general inspection' should be limited to that class of school in which the presence of ill health might reasonably be anticipated. In other cases it was contemplated that the teachers should submit ailing children to the medical officer for inspection. Despite this difference in principle from the act (English) of 1907, the declaration of the general and immediate importance of a medical examination of school children is noteworthy in itself and taken in conjunction with the general trend of expert opinion already expressed by the commission on physical training (Scotland) it had a marked effect in pressing forward the claims of medical inspection.

"The reports of these two inquiries led to a third, of an even more specific character from the point of view of school hygiene. In March, 1905, a committee was appointed by the president of the board of education (a) 'to ascertain and report on what is now being done, and with what result, in respect of medical inspection of children in public elementary schools,' and (b) to inquire into the existing arrangements of voluntary agencies for provision of meals to school children, and to report as to the possibility of its better organization. As regards (a), it was found by the committee that practically all the work which was then being undertaken was done by the local authority, either in its educational capacity or in its capacity as sanitary authority.

"**Medical Officer of Health Recognized.** One fact of exceptional interest is that several authorities had even at that time shown their appreciation of the importance of the co-ordination of the public health and school medical services by appointing the medical officer of health of the area medical officer to the educational authority. This arrangement is commented on by the committee in the following terms: 'There are distinct advantages in the school medical officer being also medical officer of health. The duties of the two offices naturally overlap or may do so. The inspection of children for the prevention of the spread of infectious disease and the sanitary inspection of the premises are examples of this. The union of the two offices tends to prevent duplication of work.' It is clear, therefore, that the committee were impressed by the importance of the intimate co-ordination of the two services, either by uniting the offices of school medical officer and medical officer of health in the same person or by guaranteeing the closest co-operation between them. It may be added that this view has been reaffirmed by the board in connection with the administration of the act of 1907, and is now generally accepted as a guiding principle by local education authorities.

"The committee also suggested the duties which might well be assigned to a school medical officer, and summarized the uses to which a school nurse might be put, both for the purposes of examination and of treatment. Finally, a tribute was paid to the teachers who had everywhere rendered assistance and the committee expressed the opinion that, in regard to a system of medical inspection, 'the measure of success which is attained must depend in no small degree upon their sympathy and assistance.'

"The committee recorded the view of several witnesses that the provision of medical treatment by local education authorities would tend to pauperize the parent, and they also pointed out that two further difficulties might be involved in the provision of medical treatment, viz., the considerable burden of expense, and the apprehensions of private practitioners.

"The committee, in summing up, recognized that much had been done to check infectious diseases, to attend to defective children, to deal with eyesight and hearing, and to arouse interest in school hygiene in general, but at the same time stated their view that there was much opening for improvement.

"**Legislation for Medical Inspection.** As regards the medical inspection of school children, the logical completion of the movement described above was, of course, the creation of a uniform and obligatory system, but some time elapsed before the recommendations of the Scotch commission and of the physical deterioration committee were put into force by Act of Parliament. The education (England and Wales) bill introduced by Mr. Birrell in 1906 proposed, in clause 35, that power should be given to the local education authority 'to make such arrangements as may be sanctioned by the board of education for attending to the health and physical condition of the children educated in public elementary schools.' The failure of the bill postponed for the time being any provision in this direction, but the whole question had been forced upon the public attention, not merely by official inquiries such as those to which reference has been made, but also in part by two international congresses on school hygiene, the first of which was held at Nurnberg in 1904, and the second in London in 1907. When, therefore, the next education bill (1907) was brought forward by Mr. McKenna, it was almost inevitable that the subject should receive further attention, and in section 13, the duty was laid upon the authority 'to provide for the medical inspection of school children immediately before or at the time of or as soon as possible after their admission to a public elementary school, and on such other occasions as the board of education direct, and the power to make such arrangements as may be sanctioned by the board of education for attending to the health and physical condition of the children educated in public elementary schools.' This clause involved the adoption of two principles: in the first place, that the most important features in the physical condition of the child should be systematically ascertained, and, in the second place, that authorities should at least have the power of attempting to make the health of the child such that he could profit by the instruction provided for him in a public elementary school.

"A few words may conveniently be added here in reference to the three circulars in which the Board, in fulfillment of the duty placed upon them by need for the co-ordination in each area of the work of medical inspection and the treatment of school children should be carried out by the local authorities. In the first of these (issued November, 1907), the scope and purpose of the act were explained, and especial stress was laid upon the need for the co-ordination in each area of the work of medical inspection under the control of the school medical officer with the public health service. The value of, and need for, assistance from the school nurse, the teachers, and the parents themselves were also explained, and suggestions were made for a schedule under which the actual work of inspection might be carried out, and as to the points with which the annual report of the school medical officer might most profitably deal. Finally, the question of amelioration and physical treatment was briefly discussed, and the directions in which steps might provisionally be taken for acting on the initial results of medical inspection were indicated. In the next circular (issued January, 1908,) the suggestions contained in the previous circular were developed into a formal schedule for medical inspection in which the board indicated the particulars, attention to which they rebarded as constituting the minimum of efficient inspection. This schedule has, almost without exception, either been adopted entirely by the local education authorities or has determined the degree and character of their inspection. Finally, in the third circular (issued in

August, 1908,) the position of the school medical officer and his relation to the medical officer of health were dealt with.

"Form the outset the Board took the view that the medical inspection of school children was but a part of school hygiene, and that the whole subject of school hygiene was not a specialty or group of specialties existing by and of themselves, but was an integral and vital part of the wider question of the health and physical condition of the nation. No student of these facts could fail to recognize that what may be called the science of school hygiene has been rapidly acquiring for itself a form and a sphere particularly its own. This, in a new branch of preventive medicine, was not only natural and justifiable, but inevitable, and the parallels to such growth throughout the realm of science and sociology are numerous. As knowledge grew and as the form of the work both in England and abroad took shape, this separate branch of hygiene came to be more and more clearly recognized. But to admit that is not to fall into the error of supposing that school hygiene, any more than any other branch of preventive medicine, could exist, much less be organized on a national basis, separately and distinct from the larger sphere of state medicine. This was one of the chief reasons which lay at the base of the Board's principle that the organization of the statutory duty cast upon local education authorities by the education act, 1907, should be undertaken in intimate relation with both the machinery and purposes of the public health service now in being in this country, which itself is the fruit of a long period of legislation and administration in that province of politics where, as Sir John Simon said, 'Medicine joins hands with Common Sense.' He it was who first showed that one of the high duties of medicine was to become a joint worker with other agencies of knowledge and action for the national interests, and that in the fulfillment of this duty the spirit of exclusiveness is surely least of all the spirit in which it should seek to exercise for those interests the powers distinctively its own.

"There were other reasons, however, which led the Board to insist that the new work should be established on a 'Public Health' basis. First, in almost all of the 328 local education authority areas, a public medical service, other than the poor law medical service, was already in existence. It is well known that for purposes of educational administration England and Wales are subdivided into 328 areas, consisting of administrative counties, county buroughs, municipal boroughs having a population of upwards of 10,000 and urban districts having a population of upwards of 20,000. It is also well known that for purposes of sanitary administration the country is divided into some 1,800 sanitary areas, many of them co-terminous with the educational areas. In each of these sanitary areas the public health authority has statutory duties to perform. Thus it comes about that there is no part of the country outside of the influence and operation of this public medical service and, as a result, in each one of the local educational areas there has been existing for many years the administrative machinery of a state medical service. It seemed, therefore, to the Board an obvious necessity, on account of both economy and efficiency, that the new school medical service should to the utmost extent work in with the existing machinery of medical and sanitary administration, developing and supplementing it as required, rather than supplanting it by bringing into existence new agencies, partially redundant and possibly competing. Thus not only would dual jurisdiction be avoided, but a further step would be taken in the direction of a simplified and unified state medical service.

"Secondly, a study of the recent developments of preventive medicine indicates that this science has become an appropriate medium for the solution of the problems of hygiene in relation to the education of the child.

"The attitude adopted by the Board has received almost universally the support of local education authorities which have in one or two ways made arrangements in accordance with the advice of the Board. Either the authorities have appointed the medical officer of health of their area to be the school medical officer, and in this way have secured at once unification of the two medical services, or they have arranged for the work of the school medical officer to be intimately co-ordinated with the work of the public health service in the area.

"**The School Medical Officer.** The school medical officer was first recognized as one having specific functions in the system of public elementary education (in England) in 1908. These functions are: (1) reporting on open air schools and similar institutions; (2) advising or approving the closure of schools, and (3) authorizing the exclusion of individual children from school.*

"In 224 out of the 307 areas for which a school medical officer is recognized, the medical officer appointed was the medical officer of health, and thus in the majority of cases a more or less complete unification of the two medical services was secured. In the remaining 83 areas the authorities have appointed a school medical officer who is not medical officer of health of the area. In 76 of these, however, the school medical officer is appointed either to be under the supervision of the medical officer of health or directly to co-operate with him. Even in the remaining cases some degree of effective co-ordination, either personal or administrative, is the rule, and upon this principle, so important in obtaining smooth and effective working, the Board has continued to lay emphasis. In point of fact, experience is proving the necessity of this intimate co-operation. School hygiene cannot be divorced either from home hygiene on the one hand, or from the health conditions of the community generally on the other. The duties of the school medical officer and the results arising from the effective discharge of these duties, involve of necessity the wider questions of the public health.

Organization of School Medical Service. Considerable variety exists in the way in which the school medical officers and their assistants are disposed; and reasonable latitude has been countenanced by the Board, who has considered the system adopted in each area broadly and on its own merits with due regard to local circumstances, and with no desire to impose a rigidly uniform system on authorities whose circumstances are widely different. The general rule, which may perhaps be taken as a standard, has been for the authority to appoint a school medical officer and subsequently give him one or more whole-time assistants as was deemed necessary. On the whole, and for most areas, this arrangement appears to have much to commend it, particularly in the boroughs and urban districts. Even in the counties the same general rule has been followed. In certain districts the medical officers of health have been selected as assistants, the county medical officer of health in each case being the supervising school medical officer. In other counties private practitioners have been selected as assistants under a supervising officer. In yet others a combined system has been used, some of the assistants being district medical officers of health, and others being private practitioners, with or without one or more whole-time assistants. As a rule, the county will have several whole-time assistants working under the school medical officer, and the towns have established a complete whole-time service.

"It is, of course, too early to form any final opinion as to the advantages of whole-time assistants as compared with part-time officers. It may be noted that there have been no cases of authorities commencing with a few whole-time assistants and changing to many part-time assistants. On the other hand, it appears that many places which established part-time assistants, changed to whole-time assistants as soon as the way seemed clear.

"By the co-ordination of the public health and school medical inspection services, it is possible for this official to deal more effectively with such questions as ventilation and the sanitary condition of the school, the cleansing of children's homes and the closure of schools and the exclusion of children. One superintending officer says:

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*A special circular has been issued by the medical officer of the local government board and by the chief medical officer of the board of education bearing upon this question of school inspection.

"'In our appointments we can survey the question from every aspect; as health officers we look upon the question from a purely health point; as school medical officers, from an educational point, and its bearing upon parliamentary grants. A dual appointment, if such existed, would in time, I am afraid, cause friction, as the two departments view the school-closing question from different standpoints.

"'Another practical advantage is that by combination of the offices the area to be traveled is, of course, reduced. It is better for one man to be medical officer of health and medical inspector of schools for a smaller area than for them to be separate persons and each have double the area to traverse.'

"**Qualifications of Medical Officers.** With few execeptions the qualifications of the medical officers selected have been carefully considered by the local educational authorities. Preference should be given to men and women who (1) have had adequate training in state medicine or hold a diploma in public health, (2) have had some definite experience of school hygiene, and (3) have enjoyed special opportunities for the study of disease of children.

"**School Nurses.** A school nurse is capable of performing very useful and important functions both in asisting the work of medical inspection and, under medical instruction and supervision, in applying or showing parents how to apply remedies for minor ailments. One hundred and forty-one local education authorities in England and Wales have appointed nurses or health visitors in connection with medical inspection.

"There can be no question as to the exceptional value of the school nurse in dealing with the physical condition of school children, a value which was fully anticipated by the Board, and has been abundantly confirmed by the local education authorities wherever an adequate scheme and suitable nurses have been introduced. In some areas special whole-time school nurses have been appointed. In others, district nurses have been used. One school medical officer, in commenting on the nurse, says:

"'She can give an inspector valuable assistance at the time when he makes his examinations; living in the district and knowing many of the children personally, she can inform the inspector as to the social circumstances of their families, and will be able often to give him much-needed information as to past illness. But the most important function of the nurse is in connection with the home-visiting of the children. She can explain fully to the parent the necessity of acting on advice which has been given in the interest of the child's health; she can stimulate the careless parent, and can assist those who are anxious to do their best for their children. She can see that further medical advice which has been recommended by the inspector, is obtained from the private medical practitioner, and she can see that letters of recommendation for hospital treatment, when provided, are properly used. The nurse can also assist and advise the mother when domestic attention rather than formal medical treatment is required. In these and other ways the services of a nurse are indispensable in any scheme for obtaining the full economical advantages which are obtainable under the new system of things.'

"**The Work of the School Teacher.** The school nurses are, however, by no means alone as the accredited agents of the authority in this new work. It is almost impossible to speak too highly of the part which has been played by the school teachers. In all areas where they have rightly understood the meaning and intention of the new legislation they have proved sympathetic and willing helpers, and in many cases their services have been invaluable.

"**The Physical Condition of School Children as Revealed by Medical Inspection.** In England special attention has been given to nutrition, cleanliness, ring-worm, condition of the teeth, condition of the nose and throat, glandular enlargements, eye disease and vision, ear disease and hearing, special diseases, etc. Under special diseases tuberculosis has received an exceptional amount of attention. It is recognized that routine medical inspection must necessarily be of great value and increasing service in discovering incipient cases of this disease, which show only those vague and indefinite symptoms that frequently cause little anxiety to the parents. By the examination of special or selected cases, children whose health is in some way unsatisfactory are brought under medical observation, and among them a certain proportion will doubtless prove to be suffering from pulmonary tuberculosis. Thus it may be possible to take steps to prevent adolescent tuberculosis, and in years to come it will be interesting to know whether persons developing phthisis showed any signs of it in school life. The available figures indicate that well-marked cases of phthisis are not numerous in the schools, and it is probable that when the disease is sufficiently far advanced to show definite physical signs the child rapidly becomes too ill to remain at school.

"Not only is it important to establish the presence of the diseases in a tuberculous child; it is also desirable where possible to make inquiry into the home circumstances of the child; partly because such information may be of some assistance when making a diagnosis, especially in a doubtful or suspected case, but also because it is necessary to have as complete a knowledge as possible of these conditions when giving advice or suggestions as to suitable treatment. Such information is also required if any steps are to be taken with regard to the protection of others from infection, or the special examination or observation of all children belonging to phthisical families. In one place where a school child was suffering from tuberculosis, the child's brother was at the time of inspection lying in the house dangerously ill with the same complaint. The two children occupied the same bed. The second child might have been preserved from acquiring the disease had the home conditions been known earlier.

"**Sanitation of School Premises.** The board of education (English) in its circular 596 stated that they considered it desirable that the annual report should deal as far as practicable with the whole subject of school sanitation and should include a general review of the hygienic conditions prevalent in the schools in the area of the local education authority."

The medical school officers are required to note conditions relating to ventilation, lighting, heating equipment, cleanliness of school rooms, cloak rooms, the playgrounds, type and condition of sanitary conveniences and lavatories, water supply, etc.

The general sentiment in this report seems to be in favor of unilateral lighting of school rooms. I wish to draw attention to one especial criticism made in this report on the lighting of school rooms, which would be very applicable to many of the city schools in Minneapolis. It is as follows: "Wire window protectors and curtain partitions have been condemned as being unnecessary absorbents of light."

"**Open-Air Schools.** The first open-air school maintained by the London County Council was at Bostall Wood, Plumstead, and was opened during the summer of 1907. Six schools were opened in various parts of the country during the summer and autumn of 1907. The children attending these schools must be selected for admission by the medical officers. Only such cases are chosen as are incapable, by reason of physical defect, of receiving proper benefit from the instruction in the ordinary public elementary schools. The children must be taught in small classes so as to obtain individual care; the hours of instruction must be short so as to avoid mental fatigue; the curriculum must provide manual training, so as to awaken dormant faculties and to arouse and to inculcate a zest for work, which too frequently remains latent among physically defective children taught in larger classes and according to the ordinary curriculum.

"The chief consideration in the choice of a site is to secure for the children as much fresh air and sunshine as possible in a clean and healthy environment. When these conditions are combined with regular and healthful food, a carefully adjusted plan of lessons, and frequent opportunities for rest and recreation, a considerable contribution has been made towards their physical restoration. Further attempt is made to locate these schools so that the children may be able to reach them easily. As to the character of the school buildings, it is important on the one hand that there should not be over-elaboration, while on the other hand, the buildings should be of a character adapted to the climate and weather of this country. Provision should be made so as to permit of the school work being carried on either out in the open air, or under some simple form of shelter sufficient to afford protection from the sun and rain, or in some more permanent type of building, such as will be found necessary in more blustery weather."

Disinfection of Schools—The importance of personal infection as opposed to infection through the medium of the school material is getting to be quite generally recognized.

"Many school medical officers consider that the advantages of systematic disinfection have been greatly over-estimated. Indeed, there are not wanting signs of a wholesome tendency to rely more upon routine and habitual cleanliness than upon artificial disinfection."

One of these school medical officers says:

"If the healthiness of school buildings is to be increased there is no doubt that attention should be concentrated on obtaining more thorough ventilation, and more frequent washing of floors, desks and walls. In order to facilitate the latter operation in future schools it would be an advantage if one of the jointless impermeable floors were substituted for wood blocks and boards."

The school medical officer for Bradford reports to his committee as follows:

"As misconception is apt to exist as to the meaning and possibilities of disinfection, I venture to draw the attention of the committee to the following considerations. No disinfection is of the slightest value unless the material used actually kills the germ against which it is supposed to be used; the use of disinfectants in a general haphazard manner is a waste of money. The germs with which we are concerned in school are those of infectious diseases. The claim which is usually made for disinfectants in connection with the ordinary school infectious diseases is, in my opinon, often of a very exaggerated nature. Personal infection, in all infectious diseases, is by far the most important cause of their spreading from one child to another. So far as the school premises are concerned, they are dangerous to health just in so far as they are dirty or dusty, and the first consideration should be to cleanse, not to 'disinfect.' The habitual use of so-called disinfectants is in my opinion objectionable; they tend to lessen the confidence of those responsible in the ordinary methods of cleansing and in such agencies as fresh air and sunlight; in water closets and urinals they are specially to be deprecated; they simply cover up smells that should not be allowed to exist."

Dr. Kerr, of London, says:

"The infection is from the children themselves, not from doors and cupboards, desks or floors; these means are trivial; it is the undetected or mild cases of carriers continuing to attend that account for school spread of disease when it exists. It is little use disinfecting a schoolroom if the clothes and persons of the infected children cannot also be disinfected.

"The cost of disinfection will always be very great, and as the cost of the disinfectant is probably nine-tenths of the whole, it is obvious that as a commercial interest routine disinfection in relation to educational buildings is likely to be pushed as energetically as ventilating expedients were once urged on an ignorant public. Far more efficacious from the dust point of view would be the use of oils as floor dressings. In many commercial houses and banks these oils are found useful."

Dr. Williams, of Bradford, England, says:

"The ideas regarding the planning of schools are undergoing some modification. There is now a decided tendency among education authorities to desert the once popular central hall type with mechanical ventilation in favor of the pavilion type with natural ventilation.

"The requirements essential in a healthy school building are an abundant supply of air and a maximum amount of daylight. These essentials are difficult to obtain in a central hall type of school, especially if the building is fitted with natural ventilation. The pavilion type on the other hand lends itself admirably to these requirements. The assembly hall and each class room can be cross-ventilated and light may be admitted from at least two sides.

"Mechanical ventilation is often unsatisfactory; there are difficulties relating to the heating of the air—the size of the shafts and the relations of inlets to outlets—it really requires an expert mechanic in order to obtain satisfactory results. Moreover, it is an expensive method of ventilation, and bearing in mind the fact that for its efficient working all the windows and doors must be closed a very undesirable object lesson is thus presented to the scholars.

"Natural ventilation demands open windows, allowing the class-rooms to be continually flushed with fresh air. It is probable that under these conditions the rooms cannot be maintained at as high a temperature as can be obtained by mechanical ventilation, but it is not necessary to keep schools at a higher temperature than about 57 or 58 degrees, and this can easily be done in a naturally ventilated school.

"A new school has recently been completed in Bradford which provides for cross ventilation and efficient lighting. It possesses the great advantage of having the assembly hall removed so far from the classrooms that no interference with class work takes place when singing or drill is being taken in the assembly hall."

Bradford is not only a leader in medical school inspection, but it has also one of the best open-air schools in England, if not the best. This school is for tuberculous or anemic children. Tuberculous children are excluded from the public schools. The school medical officer examines all children in the open-air school as necessary. Not only has this school been of benefit to these children, but it has given rise to the argument, "If fresh air is good for sick children, why should it not be good for healthy children?" and the result is that there is a tendency to build all of the new school buildings on such a plan that they may be used as open-air schools a good portion of the year at least.

The open-air school building is located on a beautiful plat of ground at an elevation of 420 feet above the sea level.

* "The building stands in a field of five acres, and faces an extensive grassy slope, which is very much appreciated by the children. Surrounding the school field on three sides is a wood of some five acres, also the property of the corporation, and to which free access is allowed. This school was established in the summer of 1908. It consisted of two large classrooms and a large veranda, baths, kitchens, etc., and accommodated 40 children. The school was considerably enlarged in 1909 and can now accommodate 120 children.

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*From report for 1909 of Dr. Lewis Williams, School Medical Officer, Bradford.

"There is a central block, which may be called the administration block, consisting of a large dining room and dining veranda, with kitchens, etc., at the back. Running east and west respectively are two wings, one for boys, the other for girls. Each wing consists of a large resting shed, three classrooms with veranda, one teacher's room and the necessary bathing, washing, lavatory and cloakroom accommodation.

"The whole school has a south aspect. The classrooms are very efficiently heated with large stoves, and ventilated with hoppers and fanlights on opposite sides of the rooms.

"The children selected for open-air treatment are those who are debilitated and below par, consequent upon the presence of some pathological condition, such as tuberculosis, including early phthisis, tubercular disease of joints in a quiescent state, enlarged glands in the neck, adenoids, bronchitis, discharging ears, anemia, rickets, chronic inflammatory eye diseases, etc. They are primarily selected in various ways, the final selection being always made by the school medical officer:

1. By the school medical officers and school nurses when visiting schools.
2. By the school medical officers at the school clinic.
3. By recommendation from doctors, head teachers and attendance officers.

"A special point is made of inspecting and examining children who attend school irregularly on account of ill health, and many such, who have not attended school for many months, have been given a fresh start in school life by a few months' sojourn at the open-air school.

"The teachers and children assemble each morning in the center of the city, those who live at some distance being supplied with checks for traveling in the tram car. The special tram car which conveys the party to Thackley (the place where the school is located) leaves the city at 8:30 a. m. At the end of the route the children are met by a bus and taken to the school building. The school being only a short distance from the car terminus, the party arrives there about 9:00 a. m. In the evening the children walk to the tram line unless the weather is stormy.

"The program for the day is as follows:

9:30 a. m.	Breakfast
9:45 to 10:45	School work
10:45 to 11	Interval for games
11 to 12	School work
12:30	Dinner
1:00 to 2:30	Rest
2:30 to 3:00	Interval for games
3:00 to 4:30	School work
5:00	Tea
5:30 to 6:00	Games

"Each child is bathed once a week under supervision, not necessarily with a view to cleanliness alone, but also as an abject lesson in general hygiene, and as a powerful restorative to their jaded constitutions. The shower baths are most excellent in every way. They provide for sixteen douche baths in the main room, with three separate douche baths adjoining for the older girls, and a slipper bath for such children as may be necessary. The three douche (shower) baths for the older girls are placed in separate compartments, and comprise a shower fed with regulating valves for supplying hot and cold water, the floor being dished toward the outlet. The large douche bath which forms the most prominent feature of the baths provides accommodation for sixteen children. It consists of four troughs each accommodating four bathers. These are supplied with a head spray to each bather, the whole of which are controlled by two valves which can be easily regulated by the teacher, and above which is fitted a thermometer to enable the teacher to regulate the supply of water from cold to hot as occasion demands. Each suite of four douches is fitted with a separate valve, so that each suite can be put on independently of the others.

"The troughs are about 3 feet wide and 9 inches deep. Each is fitted with a plug and overflow, so that the trough can be filled with water and thus provide a large bath for the babies and smaller children to paddle in if necessary. It is thought, however, that this method of bathing should not be adopted. The method of providing a spray to each child and allowing the water to run away in the trough, is better, as it reduces the danger of the water's carrying any disease or infection from one child to another. The baths are lined with tiles up to a height of 5 feet, the troughs and floors being also tiled. The walking space around the troughs and to the other parts of the floor of the bath are paved with unglazed tiles to prevent slipping. The bathroom is thoroughly cross ventilated and fitted with tippling windows on two sides. Adjoining the baths are dressing boxes, heated by means of hot water pipes, providing a separate compartment for each child, and fitted in the front with a sliding India-rubber sheet. The boxes are at such a height that the teacher or attendant can easily overlook same and supervise the dressing of the children. The whole of the bath and dressing boxes are arranged in a separate block and isolated, and thoroughly cut off by cross ventilation, so that there is no fear of steam or any smell getting into the classrooms.

"The children are under the direct supervision of the school medical officer, who visits the school at least once a week. During his visit he makes an inspection of all the scholars. He discusses with the head teacher such questions as clothing, bathing and the mode of daily routine of certain weakly children. Each child is weighed once a week.

"The committee decided late in the autumn of last year (1909) to keep the school open all through the winter. In spite of the cold weather and the considerable amount of snow in December, the work was carried on and the attendance suffered very little. The attendance during November and December was 89 per cent, and for the earlier part of the year 1909 it was 86 per cent.

"The children when presented for admission (to this school) form a most sorrowful spectacle. Physically, they are for the most part pale, thin, undersized, unkempt and neglected specimens of humanity. Mentally, they are unnaturally subdued, quiet and often sullen. On account of poverty, neglect, heredity or certain chronic pathological conditions, they are totally unfit for the ordinary strain of school life, and yet, in only a few weeks' time, these same children will become bright and attentive, clean and happy; many of them will soon look rosy and healthy; some of them quite robust and noisy. The remedy is a wonderfully simple one, and exceedingly cheap—nothing more than pure fresh air and plain good food."

Dental Conditions—The condition of the teeth of children in England was noticeably bad as compared with the condition of the teeth of American children, and this fact has made medical school inspectors give special attention to this work. What is known as Tooth-Brush clubs have been formed in certain day schools and have been of service in improving dental cleanliness. The head teacher or the Care Committee lays in a stock of tooth brushes. These brushes are sold to the children who can afford to pay at a very low price but are given to very poor children. The tooth brushes are called for inspection periodically and on every convenient occasion the necessity of tooth cleaning is insisted upon. At the open-air schools 240 children were examined and only 14 noted as possessing perfectly healthy sets of teeth.

Conclusion—In concluding this report on observations of medical school inspection in England, I wish to state that I have used the words of others to express my views on school inspection, because they had practical experience in the work and were therefore able to express themselves on this subject in better terms than it would have been possible for me to do.

Finally, I have gone thus fully into the medical inspection of schools in England because, as already stated, the conditions of that country and Minnesota are somewhat comparable. They are certainly comparable so far as relates to the smaller cities, villages and rural population, and it is in these districts particularly that in England the Medical Officer of Health and the School Medical Officer are one and the same person. From Dr. Newman's report it is shown that in England the school authorities have accepted the medical officer of health as their inspector and it is this course which Dr. Newman, who is at the head of medical school work in England, advises; but it must be noted that in England the medical officers of health are all men trained in public health work, many of them holding a degree in public health. Further, the appointment of these health officers is subject to the approval of the local government board and they cannot be dismissed without cause and without the approval of the local government board if "state aid" is to be given; and this holds true also in Scotland (and in Ireland?). It would thus appear that if Minnesota is to take up medical school work in conjunction with the work of the health officer, the school authorities should be assured of the competency of the medical health officer, and some system should be adopted by which, although the medical health officer and medical inspector of schools might be appointed by the local authorities, his appointment should be confirmed by the State Board of Health, and he should be continued in office until disqualified for incompetency. It might be impossible at the outset to establish a system of medical school inspection to cover the entire state but a permissive law might be passed somewhat along the following lines. A municipality or district choosing to establish a system of school inspection should work in conjunction with the local health authorities. In order to secure a competent man as health officer and medical school inspector such municipality or district should appeal to the State Board of Health. Said Board might select a competent inspector. Thereupon the municipality or district through its council and its board of education should appoint such individual to act for them. A joint arrangement for the payment of the salary of such official might be made upon the following basis: If for a municipality, the municipality to pay one-third, the board of education to pay one-third and the State Board of Health to pay one-third; if for a district (including a small municipality and surrounding country), then the salary might be put on a basis possibly of one-fourth from the municipality, one-fourth from the board of education and one-half from the State Board of Health, or even a larger proportion from the state if a considerable rural district was taken in. This would provide immediately for the creation of certain centers where good work might be done from all points of view as relate to public health work and medical school inspection and as the needs of those districts were shown others could take up the work.

Any individual indicated in this type of work should give his or her whole time to the work and should receive a living salary. In England and Scotland the salary ranges from 500 to 800 pounds. The equivalent salary in this country should not be less than $3,000 to $5,000. It might be a question whether such legislation should include the larger cities; i. e., the cities of the first-class in Minnesota (Minneapolis, St. Paul and Duluth), but if state aid were given in this work it would seem that even these cities should be willing to come into this general group. Certainly it would be an advantage for any city having a population of 100,000 or less to receive aid both in organization and in support from the state.

So far as would relate to the duties of such official as health officer, they should be defined by the State Board of Health. His duties as medical school inspector should be defined in part at least by the board of education, but undoubtedly certain of his duties would be such as would of necessity require a conference between the State Board of Health and the board of education before final settlement.

REPORT ON THIRD INTERNATIONAL CONGRESS ON SCHOOL HYGIENE.

This congress was held in Paris August 2nd to 5th inclusive. Its work was divided into eleven sections as follows:

1. Educational buildings and furnishings;
2. Hygiene of residential schools;
3. Medical inspection of schools and individual health methods. Practical measures for actual application.
4. Education and physical training;
5. The prevention of contagious diseases in schools. Illness attributable to school attendance.
6. Out-of-school hygiene. Open-air schools. Vacation colonies;
7. The teaching staff; their hygiene; their relation with the homes and with the school doctor.
8. Teaching of hygiene to teachers, scholars and parents;
9. Teaching methods and syllabuses in relation to school hygiene;
10. Special schools for abnormal children;
11. Hygiene of eye, ear, mouth and teeth.

It will be seen from the above that the congress was well organized but it was possibly over-divided, for it was very difficult to keep track of the papers which one might wish to hear.

The congress was well housed in the Grand Palais of the Champs Elysees.

The first congress was held at Nuremburg in 1904 under the presidency of Professor Griesbach, who initiated these international gatherings; the second congress, in London, in 1907, when Sir Lauder Brunton was president. The next congress is to meet in Buffalo, New York, in 1913, the invitation being conveyed from Buffalo by Dr. F. E. Franczack. This invitation was endorsed by the American Association of School Hygiene through Dr. Thomas Harrington of Boston; and it is understood that the entire planning for the congress will be in the hands of this association.

Dr. A. E. Remmett Weaver, medical officer of health and school medical officer for the Abertillery district (England), made a very full report on this meeting and kindly furnished me with a copy of his report, from which I will quote quite freely.

"The idea of the International School Hygiene Congresses was initiated in 1902 by Professor Griesbach. The two preceding Congresses greatly stimulated international knowledge of and interest in the many phases of school hygiene and led to much progress and many reforms. For example, they greatly assisted in the passing of the act providing for medical inspection in

England and also influenced the manner of its application by the board of education.

"The congress at Paris brought together about 1700 members from all parts of the world."

Connected with the Congress was an exhibition located on the first floor of the building, the section rooms being located on the second floor.

"The exhibits comprised special photographs, diagrams, illustrated books, models, etc., showing the school structure and equipment, the arrangements for and results of physical exercises, school bathing, manual instruction, cooking, etc. There were also illustrations of the methods of medical inspection, inspection schedules, etc. The trade exhibits comprised mainly sanitary bathing, gymnastic and disinfecting appliances and a vast variety of school desks, books, diagrams, etc. Among the sanitary appliances were many forms of the seatless closet (Sieges a la turque) for use in the squat position. which is the natural one for defalcation. These closets are very much used in the French schools. Several types of school baths were shown. On the continent a rapidly increasing number of schools are provided with them. In Norway, for instance, 27 per cent of the schools have baths. Great advantages in the way of increased cleanliness, attention and health of the children are claimed to result from the use of school baths.

"In the afternoons elaborate exhibitions of physical exercises, including gymnastics, marching, dancing, games, etc., were given by pupils of various French, Italian and English schools and colleges.

"The inaugural meeting was held in the Grand Amphitheatre of the Sorbonne under the presidence of Dr. Landouzy, the Dean of the Faculty of Medicine of Paris, as deputy for the honorary president, M. le Ministre de l'Instruction publique. Dr. Albert Mathieu delivered the opening address. In it he insisted on the importance of fresh air and physical exercises to counterbalance the deleterious effects of school rooms and congested curricula, paraphrasing Goethe's dying words, 'Light, more light.' He said that the cry, 'Air, more air,' suggested the following resume of the hopes and wishes of the International League of School Hygiene:

'More air in the school;
More air in the lungs;
More air in the curriculum!'

"The plenary meetings and those of the eleven sections were held on the Wednesday, Thursday and Friday mornings, the various sections meeting concurrently."

At the plenary sessions the following subjects were discussed: Wednesday, the Uniformity of Method for Physical Examination of Schools; Thursday, Sexual Education; Friday, the Training and Appointment of the School Doctor.

"In discussing the first of these subjects, Dr. James Kerr of the London County Council made a vigorous protest against the elaboration of purely scientific and anthrological statistics. He also depreciated over-elaboration of efforts to check the spread of infectious diseases by administrative action in the schools themselves, instancing as useless and expensive the daily visits to some American schools by the school doctor."

He stated that medical inspection in the school had come before the public in two aspects; viz., (1) for the prevention of infectious diseases and (2) medical inspection in regard to healthy children apart from the infectious diseases. His latter division he further divided into (a) the scientific aim of raising the standard of public health and improving the methods of education by furnishing knowledge as to the various factors affecting the health and development of children and (b) the practical aim of detecting any defects in individual children with a view of remedying them.

"Dr. Kerr's paper, based upon his long and wide experience, struck the right note of practicability as regards medical inspection by pointing out that 'in all matters of public health the general solution of any problem is always a matter of compromise, a balancing of the cost in time and money expended, with the result to the public which it attained.'

Section 1. The importance of appropriate construction, as regards lighting and ventilation combined with efficient supervision of the sanitary conditions of the schools, when erected, seems to be much more appreciated in countries like Switzerland, Germany and Sweden than in England (and the United States). The following proposal was submitted to this section: 'It is desirable that in all educational establishments, necessary measures should be taken in order that shower-baths become obligatory, and that in schools which are to be built the shower-bath be considered as part of the necessary school equipment.'

"**Section 3.** In papers upon the relationship between the school doctor, the teacher and the family doctor, the cordial co-operation between doctors and teachers was insisted upon and it was suggested that the headmaster should be responsible for the maintenance of the cleanliness of the premises and the pupils. The teachers were referred to as the 'keystone' to school hygiene, to be especially trained in hygiene and to be regarded by the school doctors as their chief agents.

"An epitome of the arrangements for medical inspection in the more important civilized countries shows the following:

"France. The organization of the present Paris School Medical Service dated from 1879, but in October, 1910, a new and more elaborate system will come into force. Under the present (old) arrangement, Paris is divided into 126 school districts with a medical inspector of schools for each district. The school doctor visits each school twice a month and oftener in times of epidemics. At the school he inspects the lobbies, playgrounds, sanitary conveniences and classrooms, as regards cleanliness, light, warming, ventilation, furnishing, etc. Then he inspects the children, particularly those to whom his attention is drawn by the teachers, and excludes those in whom he discovers any suspicion of infectious disease. The latter are seen by the doctor at his own house before they are permitted to return to school. Individual examinations of teeth, eyes, ear and general condition of the children are made. A report on the sanitary condition of the school is made to the president of the district council within twenty-four hours of each visit. In 1885 the school medical service was extended to the suburbs of Paris, which are now under the control of 57 doctors. In the remainder of France the school medical service varies with the locality, but in large towns such as Bordeaux, Lyons and Marseilles there are well organized systems. The work of the school doctor has been more particularly concerned with the prevention of contagious diseases and the sanitary condition of the schools as a whole, rather than with the exact condition of individual children. In Nice, however, for some years a separate schedule of inspection has been provided for each pupil. Beginning with October, 1910, the medical service in Paris will be revised and 84 extra doctors appointed, making a total of 210, school medical officers. Each doctor will have the supervision of not more than 1,000 children, and will visit each school in his district every week for sanitary inspection and special examination of children. The most important alteration, however, will be the examination of every child during the first few months of its school life according to a schedule similar to that in use in England, and the taking of measurements of height and weight every six months. The school medical officers also consult and recommend children for the school colonies established by law. The children are selected from among the poorer classes and are such as would be benefited by a stay in the country."

England—Medical school inspection is well organized. The general tendency is to secure school doctors and to carry on the inspection in connection with the duties of the medical health officer except in the larger cities, where special men giving their whole time to the work are employed. (See report on Medical Inspection of Schools.)

"**Canada.** No generally organized system, but some amount of inspection in Halifax, Montreal, Winnipeg, etc.

"**Australia.** No general system but examination of selected children in Tasmania and New South Wales. While in other states systematic inspecis likely to be soon instituted.

"**New Zealand.** No organized system possible at present.

"**United States.** Organized inspection in many cities and in a few states.

"**Germany.** No imperial system, but over 400 towns have instituted medical inspection, based on the celebrated Wiesbaden model. The system in some towns is mostly highly organized, with clinics for special diseases and for teeth.

"**Norway.** Provision made by act of 1889 for inspection in national schools in towns.

"**Sweden.** Organized in secondary schools from between 1830 and 1840, but every school now has to have a medical officer, appointed and remunerated by the government. Elementary schools have no government system, but there are school doctors in all the greater cities and in a number of the county communities, with a number of the polyclinics and dental clinics. The system, initiated in Stockholm in 1899, has been highly developed since 1903.

"**Denmark.** No general system, but organized medical inspection in Copenhagen, the larger provincial towns and in rural districts near the capital.

"**Switzerland.** Well organized in most Cantons, especially with regard to the supervision of the school buildings."

Of the above countries, England is the only one with an organized state system of medical inspection.

"**Section 5.** In cases of outbreak of diphtheria in schools, exclusion on the results of bacteriological examinations of swabs of the throats of all the children in the schools, as is done in many of the English and American schools, was advocated, but did not meet with general support. Dr. Harrington, of Boston, advocated the taking of a 'measles history' of all admitted children. (This has been done in some English towns.) Two advantages of taking and keeping up to date such a history suggest themselves: (1) it would improve attendance in the senior departments, during measles epidemics, of those children who have had measles. A number of children, especially girls, are kept away on the plea that they have not had measles. A reference to the school history would decide the case; (2) It would direct attention to those children who should be watched or excluded, when measles has been introduced into the school.

"**Section 6.** Interesting accounts of valuable pioneer work as regards open-air schools was given in this section, which had the advantage of the presence of Dr. Neufort, of Charlottenberg, the founder of the first open-air school, which has been copied by the London County council and other authorities in England.

"Open-air schools are very valuable for the treatment of debility, anemia, latent or threatening tuberculosis, enlarged tonsils and adenoids, etc. The children usually remain at the school from 9:00 A. M. to 5:00 or 6:00 P. M. and are supplied with meals and baths. All instruction is conducted in the open air or in sheds or rooms with one side open. A midday rest in the open air is enforced. An account of the open-air schools at Bradford, Sheffield and in the United States was given, also of various holiday and sanitary camps. Dr. Harrington mentioned that Boston had a hospital school for active tubercular cases in addition to open-air schools. Dr. Brannan, of New York, proposed a resolution suggesting that all schools should attempt to initiate the open-air type and have continuously open windows.

"**Section 8.** The necessity of giving teachers a sufficient knowledge of school hygiene was dwelt upon by various speakers."

(See also "School Hygiene," English, September, 1910.)

REPORT ON THIRD INTERNATIONAL CONGRESS ON THE PHYSICAL EDUCATION OF THE YOUNG.

This congress was held at Brussels, August the 10th to 13th inclusive.

Through the Commissioner of Education, Washington, D. C., the United States was represented at this congress by Doctors A. T. Cabot, of Boston, R. Tait McKenzie, of Philadelphia, Thomas F. Harrington, of Boston, and H. M. Bracken, of Minneapolis. These representatives made a report to the commissioner of education under date of September 7, 1910, Dr. Harrington acting as spokesman, as follows:

"I have the honor to respectfully present the report of the third international congress on the physical education of the young, hold at Brussels, August 10th to 13th of the present year. The congress opened August 10th at the Grande Salle des Fates of the Brussels exposition. Dr. Victor Desquin was president of the congress. In his opening address Dr. Desquin pointed out the extreme importance of physical education and the wide spread recognition of this fact today. 'L'elan est donne declare-t-il, il ne s'arretera pas.'

"M. A. Fosseprex, the secretary general of the congress, presented a report in which he declared that physical education is a question of progress of patriotism, and of humanitarianism; that it makes each child a strong unit in the collective humanity; that it is not possible to separate the physical education from general education, for all the biologic phenomena, which are intellectual, moral, or physical, are intimately united. He contended for shorter lessons in schools in order that the pupils might have more time for physical exercises in the open air. Following this report the delegates representing Holland, Austria, Russia, Mexico, Argentine, United States (Dr. McKenzie), Portugal and France presented the greetings of their respective governments.

"The work of the congress was divided into two general divisions, one devoted to the theory of physical education; the other to the method and application. A series of questions had been prepared and different authorities asked to prepare a report on each. Daily sessions were held on August 11th, 12th and 13th.

"At the opening session the question of preparation of the young for military life was discussed and out of the discussion, the following resolutions were adopted: (1) All grouping recalling the school battalion should be banished from the school. (2) The instruction given in the school and in the societies should not encroach upon the professional military domain. (3) The federation and sporting societies keep their autonomy and in exchange for certain advantages, they offer to the state the result of their work. (4) The gymnastics applied to the school ought to be adequate to the aptitude and to the nature of the child, and directed by educators possessing pedagogical knowledge.

"At the second session the question of games, plays and sports was presented. In this report and discussion, the difference between organized games and free play was pointed out, and the dangers of prolonged sports, such as football for half an hour, in producing hypertrophy of the heart, was emphasized. There was much difference of opinion on the value and the advantages of football as a school sport, especially for boys under the age of eighteen years. Handball was favored in preference to football. All matches, contests and competition in sports were condemned. Athletics for sport's sake alone were advocated. Here, as in the previous report on preparation for military life, the problem did not have direct bearing upon the conditions in the United States, many of the games and sports discussed, especially football, being different from the American school games.

"M. Sluys maintained that the aim of play is the recreation, the development of sociability; that contests and matches destroyed these; that one plays only for the glory. He expressed himself strongly against the publicity given to the 'ridiculous and murderous' sporting events.

"The congress advocated the adoption of plays and sports better adapted to the physiologic development of the pupils, and recommended a greater preparation of teachers of physical education in point of view of plays and sports. After the age of eighteen years, interscholastic matches and the giving of prizes of very small value were permitted.

"The reports on questions of general methods and on the application of gymnastics were very important and brought out some heated controversies. The discussion at times partook much of the form of personalities between the advocates of rival schools. After much heated discussion it was voted to adopt the conclusion that: (1) Pedagogic gymnastics ought to comprehend the attitude, the movements, the exercises of which the scientific and experimental studies have verified the physiologic effects as capable of favoring the aim of physical and general education. (2) There is cause for forming laboratories where the physiologic effect of the different gymnastics should be studied. The results of the labors should be published in a bulletin. The labors should be confined to physiologists possessing the technic of special instructors and accustomed to the practice of gymnastic exercises.

"The congress took a decided stand in favor of little or no formal gymnastics in the kindergarten and lower primary grades. At that age, the education of the aptitudes by means of play with playthings, marches with songs; allegorical plays and dances were favored. In the upper primary classes, the corrective and analytic gymnastics become most important. 'In the first two years of the grammar school and in the classes below those of the atheneum, one should give equal attention to each of the three aims—hygiene, esthetic, economic—but accentuating somewhat corrective gymnastics. He should accustom himself to notice, at that age, in the pupils' homes, an evolution of the organism which it is necessary to watch closely if one wishes to avoid the deformities.' (Deneve.) In the last year of the grammar school and in the high school, the exercises of application take a prominent place. Games and sports should be recommended in these grades to young men.

"In the discussion of the application of gymnastics, the following resolutions prevailed: (1) That pedagogic gymnastics should be the basis of the application of gymnastics; (2) the applications under the form of play, of swimming, of dances, of rhythm should appertain to the programs of all degrees of instruction and ought to be in harmony with the fundamental principles of pedagogic gymnastics; (3) the professional application of gymnastics, such as the special exercises of military gymnastics, of those of firemen, of marine, etc., do not form a part of the progrem of schools; (4) the school gymnastics should not go to the application but should tend toward it.

"On question number six, 'Comparative value of the theoretic deduction and the scientific experimentation in the fixation of the basis of the method,' M. G. Demeny presented the results of his researches. This report was construed as an attack upon present methods of gymnastics, epecially the

Swedish school. Two sessions were consumed in the discussion which became very personal at times. Demeny contended for movements which, in order to obtain the maximum of useful effect, must be natural and have a practical aim. He deprecated the artificial movements and advocated movements more complete, more varied, more conformable to those connected with the ordinary occupations. He pointed out especially the abuse of the movements of respiration so often associated with an unnecessary expenditure of force preceding the effort.

"At the session on August 12th, the following resolutions, which had been adopted at the international congress on school hygiene at Paris the week previously, were adopted: (1) It is desirable that the physical education of all the boys and of all the girls in all schools, public and private, shall be obligatory. (2) It would be well that in all the examinations, the major points should be reserved for those who prove that they have followed a good course in physical education.

"Many of the other questions presented at the congress were similar to those discussed at the Paris congress on school hygiene, i. e., medical examination of boarding schools; hygiene of games, plays and sports; baths, shower baths and swimming; difference between rural and urban organization of gymnastics; school excursions; plan of gymnastic lessons, etc.

"Each day practical demonstrations were given by classes from the various schools, of Brussels and vicinity. The congress concluded with a fete of gymnastics comprising about eight thousand gymnasts; this demonstration formed a part of the Brussels general exhibition in session during the congress on physical education.

"The delegates representing the United States desire to express their high appreciation of Mr. Bryan, the United States minister at Brussels, for his kind assistance in their mission, and to thank him for his homelike hospitality and entertainment during their stay at Brussels.

"This report is respectfully submitted on behalf of the delegates, Doctors H. M. Bracken, R. T. McKenzie, A. T. Cabot and Thomas F. Harrington, who met formally at Brussels and authorized its presentation by the undersigned.

"(Signed) THOMAS F. HARRINGTON,
"Director of School Hygiene, Boston Public Schools."

MILK INSPECTION.

Practically no steps have been taken during the past two years to improve the quality of milk sold for human consumption. Recent investigations by the public have given the people to some extent a knowledge of conditions as they were known by sanitarians to have existed for years. Money is still spent for the killing of tuberculous animals and for the prosecution of dairymen without any intelligent attempts at educating the dairyman to approach a standard of cleanliness that is quite possible. It is desirable that tuberculous animals should be eliminated from the herds of the state but if the state is to compensate for the destruction of such animals it should be for the first inspection only. Those who purchase dairy stock should understand that if compensation is given for tuberculous animals found on first inspection on the premises, it would be with the understanding that in future no compensation would be paid for tuberculous animals if they were again found in the possession of one who had previously received compensation. With such an understanding and personal responsibility, more pains would be taken in the purchase of dairy cattle.

It is absurd to state, as has been done frequently in Minnesota, that the health of the people is materially benefited by the use of the tuberculin test on cattle and it is unfortunate that in many instances the tuberculin test has been the chief feature in the framing of ordinances governing the dairies.

It is becoming quite generally known now that dairy milk is a far-reaching cause of death, especially among infants. It is therefore important that those selling milk should be educated in the methods of handling and disposing of same. If the same amount of money that has been spent in Minnesota during the last ten years in the killing of cattle had been spent in the education of the farmer and dairyman as to the best methods of handling his stock in order to secure the greatest return and at the same time protect his animals from disease, Minnesota would be in far better condition than it now is so far as relates to the sale of milk for human consumption.

To quite an extent the consumers are at fault in dealing with the milk question, for too often they are more interested in a low price than in a clean, pure milk with a low germ content. They should demand a milk produced and handled in such a way as to render any process of removal of dirt unnecessary. Cows' milk is practically the food for all hand-fed infants, and it is a common article of diet in every home and public eating place. Few appear to realize the full food value of milk.

In order to secure a good milk product, the following points should receive constant consideration by those having control of the milk supplies in the various municipalities:

(1) The proper selection of cows;
(2) The proper feeding of cows;
(3) The proper construction of stables;
(4) The proper care of stables;
(5) The proper care of the cows:
(6) The proper care of the milk.

Milk from unhealthy cows should not be permitted. The physical examination of dairy cattle will do much toward eliminating this source of danger. Farmers and dairymen should be advised and compelled if necessary not to buy dairy stock that had not been subjected to the tuberculin test. This is an economic problem. If purchasers of cows are careless the amount of bovine tuberculosis will gradually increase and the value of dairy stock will be impaired.

In the housing of cattle a definite cubic space per cow, a definite amount of light and a definite system of ventilation should be insisted upon. The housing of cows in the dark, moist atmosphere of some of our dairy barns should not be tolerated. It is simply absurd to allow cows to stand in a mire of manure, as is so often done, and to allow them to become plastered over with a layer of manure that is not removed between fall and spring, if the milk of such cows is to be used for human consumption.

As to the care and marketing of milk, local sanitarians should insist upon this being done properly. Otherwise, the milk should be excluded from sale. The use of any other food product in as filthy a condition as is a large proportion of the marketed milk would not be tolerated. Water containing an equal proportion of filth would be classed as sewage. It may safely be said that but a very small proportion of the milk sold in the cities and villages throughout Minnesota is fit for use.

Much is now being said about the Pasteurization of milk in order to secure a safe milk supply. The municipality that has to resort to this means is to be pitied, but pasteurized milk is better than non-pasteurized dirty milk, and it may be necessary for the larger cities and villages to adopt some systematic method of Pasteurization under inspection while the general improvement of dairies and dairy herds is in process.

Milk often becomes the means of transmission for certain preventable diseases such as typhoid fever, scarlet fever, diphtheria, tuberculosis, etc. This source of danger from the milk can practically be cut out by proper pasteurization.

It would seem as though three standards might be recognized for milk in the cities and larger villages:

1—Certified milk.
2—Inspected or standard milk;
3—Pasteurized milk.

Fair prices for these under ordinary conditions would probably be 15, 10 and 8 cents a quart respectively. These standards would meet the requirement of those who demand pasteurization for the poorest milk, but would put a premium on farmers producing the higher grades of milk. Both the certified milk and the inspected or standard milk should come from tuberculin-tested herds only, but the inspected or standard milk might be allowed a count of 100,000 bacteria per cc., as against 10,000 bacteria per cc. for the certified milk.

The pasteurization of commercial milk should be carried out by preference at a single plant. A city providing a pasteurizing plant should have an inspector at its plant during the entire process of receiving, pasteurizing and bottling of the milk. This would cover only a part of each day. The inspector would then be in a position to take samples of the milk from the cans, to note the methods of pasteurization and be responsible for the handling of the milk from its reception at the plant until put in the cold-storage room ready for delivery to the patrons the following morning. The central plant should be in a clean neighborhood and might without any objection be in a residence district. The best plants now maintain a laboratory man. Pasteurization should be carried out according to the most recent and approved methods; i. e., the holding process.

There should be contracts with farmers covering points relating to the care of the barns and of the cows. There should also be regulations relating to the cooling of the milk immediately after being taken from the cow and a temperature designated at which the milk must be kept until delivered to the wholesale plant or to the milk consumer. All such rules should be printed on muslin and posted in the barns.

MEAT INSPECTION.

Minnesota is still without any meat inspection law. As pointed out in my report to the last legislature, the federal laws relating to meat inspection were passed for commercial rather than sanitary reasons. The people of the United States benefit by these laws only in so far as they may use meat prepared for interstate or foreign sale. But a small portion of the meat consumed in Minnesota is killed under federal inspection and, as a matter of fact, these inspection laws make buyers more careful, so that the doubtful or diseased animals are left at home for slaughter without inspection, and for consumption by our own people. Even in the larger cities a considerable proportion of the meat on the market is slaughtered without inspection. A meat consumer in the United States has no assurance under the present law that the meat he buys has been inspected unless he in person sees the carcass from which the meat is cut and notes whether it bears the government inspector's tag. He may not even then be sure that the meat he will eat later has been inspected unless he sees his purchase cut from the inspected carcass and carries it with him to his home. The federal inspection laws are no guarantee as to the quality of meats consumed in this country. If we are to secure meats of good quality for our citizens some state action is necessary. To do this it is either necessary that an appropriation should be made to carry out free inspection for the state as is done for the federal government, or a system of inspection fees must be established to cover the cost of inspection. Had the federal government instituted such a system of inspection fees it would have been a simple matter for the various states to follow a similar course, but free federal inspection with a fee system of state inspection is somewhat open to criticism. However, small inspection fees should be borne willingly by the local butchers, for if there is not some system of inspection and protection for local butchers the tendency will naturally be to decrease the amount of meat consumed through these local sources.

A very excellent bill was introduced before the thirtieth session of the Minnesota State Legislature, which made provision as follows:

"**Section 1.** All cattle, sheep and swine, hereafter slaughtered for the purpose of sale for food, in any of the counties of the state of Minnesota, shall be inspected, both before and after slaughter, under such rules and regulations as the State Board of Health and Vital Statistics shall prescribe, for the purpose of determining whether said cattle, sheep and swine have been affected by infectious diseases and are unfit for food.

"**Section 2.** Upon the passage and approval of this act, it is hereby made the duty of the State Board of Health and Vital Statistics, and it is hereby authorized and empowered, to appoint one inspector for each of said cities, villages and boroughs, who shall reside therein, and one inspector for each of said counties, who shall reside therein. Said board shall from time to time appoint such deputy inspectors as it deems best; and all provisions of this act relating to inspectors shall apply to their deputies, except that each deputy shall make report to the inspector of the city, village, borough or county, from which he is appointed, instead of to said Board, and shall act in the name of such inspector, and his acts shall be recorded in the records kept by such inspector, and he shall pay the fees collected by him over to such inspector. Each inspector shall promptly report to said Board any failure on the part of each deputy in the performance of his duties.

"Each inspector before his appointment shall pass an examination as to his qualifications for the position satisfactory to said Board, and said Board shall issue to him a certificate, under seal, stating that he has passed such examination and has received the appointment.

"Before entering upon his duties, and at the time of receiving such appointment from said Board, each inspector shall take an oath and shall give a bond in the penal sum of one thousand dollars, running to the state of Minnesota, for the faithful performance of his duties. Said bond shall be executed by at least two sureties, who shall each justify in the sum of one thousand dollars, and said bond, with the sureties thereon, shall be approved by the president and secretary of said Board, and their approval in writing endorsed thereon. Said Board shall cause said bonds and said oaths to be filed in the office of the secretary of state, together with a duplicate copy of the certificate of appointment, within ten days after such appointment is made. In case said instruments are not so filed, said appointment shall be void. All such bonds, oaths and certificates of appointment, shall be recorded by the secretary of state in books to be kept for that purpose, and the record thereof is hereby made of the same force and effect as the originals.

"**Section 3.** It shall be the duty of each owner of cattle, sheep or swine, who desires to have the same slaughtered and the product therefrom sold for food purposes, within the territory covered by the terms of this act, to apply to the inspector of the locality where the slaughter of said animals is to occur or the product therefrom is to be sold, to have said animals and the product therefrom inspected. In case of his failure to do so he shall be guilty of a misdemeanor, and upon conviction of such offense he shall be punished by imprisonment for not less than ten days and not more than thirty days, or by a fine of not less than five dollars and not more than twenty-five dollars, or both.

"**Section 4.** It is hereby made the duty of each inspector, whether the owner has requested it or not, to inspect each of said animals slaughtered or to be slaughtered for the purpose of sale for food within his territory, before slaughter, and the product therefrom after slaughter, for the purpose of determining whether said animals and the product therefrom are affected by infectious diseases, and whether they are sound and wholesome and fit for food. In making such inspection each inspector shall use such tests as the said Board may direct, and shall follow strictly all rules and regulations laid down by it. If, upon inspection before slaughter, after the proper examination and test has been made, the inspector is satisfied that the animal is affected with an infectious disease, and that the meat therefrom would be unwholesome and unfit for food, he shall immediately condemn said animal, and place it in quarantine separate and apart from other animals, where it shall be killed and its carcass shall be buried, burned or rendered, and the product disposed of under the direction of the inspector. In case the owner thereof shall request another inspection after the animal has been killed, the inspector shall make the same upon the payment of his fees for both inspections and the expenses of the care and destruction of the animal, and if upon the second inspection, the inspector shall decide that the animal was not affected by an infectious disease, and that the products therefrom were not unwholesome and unfit for food, the second inspection shall control, and the products therefrom shall pass inspection for sale. If after proper test and examination, the animal is found by the inspector to be free from infectious disease, the inspector shall pass it for slaughter.

"After any such animal, passed for slaughter, has been killed, the inspector shall at once cause it to be duly examined and tested, for the purpose of determining whether or not the animal was affected by an infectious disease, and whether or not its meat is wholesome and fit for food. If, after the proper examination and test, he is satisfied that the meat of such animal is unwholesome and unfit for food, he shall condemn the carcass of said animal, and cause the same to be buried, burned or rendered, otherwise he shall pass the meat therefrom for sale. If such carcass is rendered the product therefrom shall be disposed of under the direction of the inspector.

"**Section 5.** Each animal or piece of meat examined and condemned by an inspector shall be tagged, stamped and marked by him as condemned, and each animal or piece of meat which passes inspection shall be tagged, stamped and marked by the inspector as having passed examination and as saleable. Each tag, stamp or mark affixed by the inspector shall be plainly marked with his name and the date and place of inspection.

"Whenever any animal or meat passes inspection as herein provided, the inspector shall issue to the owner, or to the person having the same in charge, a certificate stating that fact, and that said animal or meat is saleable, which shall be signed by him and dated on the day of its issue. All such certificates shall be made and issued in triplicate, one to be kept in the office of the inspector, one to be sent to be filed with said Board, and the third to be delivered to the owner or the person having said property in charge.

"**Section 6.** Each inspector shall enter in a book to be kept by him for that purpose, a record of all animals and meat inspected. Such record shall show the number of animals and the number of pieces of meat inspected, the time and place of inspection, the name of the owner, the name of the person at whose request the inspection was made, the name of the person in whose custody the animal or meat was at the time of inspection, the fees charged, and the fees received for such inspection. The record shall also show, in each instance, whether the animal or meat, as the case may be, was condemned, or whether it passed inspection, and if condemned, when and where destroyed. The records shall be kept in the office of the inspector, and shall be delivered by him to his successor in office, or to the board, together with all books, papers and correspondence relating to the business of such office. Whenever, and as often as any record book shall be filled, the same shall be sent by the inspector to the secretary of the Board, and the same shall be by said Board preserved. Said Board shall at all times have access to the books, records, papers and documents in the office of each inspector. .

"**Section 7.** Each inspector shall make a full and complete report of all his acts to said Board at the end of every month. Said report shall contain a statement of all matters required by this act to be set down in the record book of the inspector, together with such other facts as said Board may require, and also such other matters as the inspector may deem best.

"**Section 8.** Each inspector shall pay over to the secretary of the Board, at the close of each week, all fees collected by him under the provisions of this act. The secretary of said Board shall pay all such fees, monthly, into the state treasury, and the state treasurer shall place and keep them in a fund which is hereby established to be known as the 'Animal inspection fund.' All money paid into said fund shall be used exclusively to pay the fees established by this act, and to defray all the expenses contemplated hereby or incident to the inspection herein provided for.

"The state treasurer shall from time to time disburse the money in said fund upon the order or requisition of said Board, and not otherwise. Said Board shall keep true and correct books of account in which shall be set down all items received and paid out under the provisions of this act. It shall include in its annual report a complete statement of all fees so received and disbursed.

"**Section 9.** No inspector shall, during his term of office, traffic, either directly or indirectly, in any cattle, sheep, swine or in any product therefrom.

"**Section 10.** It shall be the duty of each inspector to enter complaint before any court of competent jurisdiction against any person who shall violate any provision of this act.

"**Section 11.** Each inspector shall hold office until his successor has been appointed and qualified; provided, however, that any inspector may be removed at any time by said Board by a majority vote thereof.

"Section 12. Each inspector shall collect from the owner of the animals or meat inspected, or from the person in charge, and he shall pay to the inspector upon demand at the time of the inspection, the following fees, viz.: For all cattle inspected before slaughter, ten cents per head, and for the inspection thereof after slaughter, five cents per head. For all sheep and swine inspected before slaughter, three cents per head, and for the inspection thereof after slaughter, two cents per head. For all cattle inspected after slaughter, but which have not been inspected and marked before slaughter, twenty cents per head. For all sheep and swine inspected after slaughter, but which have not been inspected and marked before slaughter, ten cents per head. For one hundred pounds, or fraction thereof, of beef, not marked as having theretofore duly passed inspection, five cents. For each one hundred pounds, or fraction thereof, of pork, mutton, lamb, veal or smoked meats, not marked as having theretofore duly passed inspection, ten cents.

"Provided, however, that when it appears from an inspection of a condemned animal after slaughter that the animal inspected ought not to have been condemned, the inspector shall refund the amount per head collected after slaughter.

"For the purpose of aiding the state in the collection of the fees herein provided for, it is hereby given and there is hereby created for its benefit a lien upon each and every animal or piece of meat inspected, or the product thereof, under and by virtue of the terms hereof. In case the fees herein provided for are not promptly paid to the inspector at the time of the inspection, he is hereby authorized and directed to seize and sell the animal or meat inspected, or the product thereof, at public or private sale, without notice, and after deducting from the amount received on such sale the fees herein provided for, and all expenses incurred in making such sale, to pay over the balance to the person who owned such animal or meat at the time of the seizure, or from whose possession the same was taken.

"Section 13. Each inspector shall receive, as compensation for the performance of his duties as prescribed by this act, seventy per cent of all fees directly collected by him, and ten per cent of all fees collected by each of his deputies, and each deputy shall receive, as compensation for his services, sixty per cent of all fees collected by him. The remainder of the inspection fees provided for in this act shall be used for defraying the expenses incurred in carrying out the provisions of this act, it being the intention hereof to make the fees provided for herein pay all expenses incurred hereinunder.

"Section 14. The sale of beef, mutton, lamb, veal, pork or smoked meats for food, within any of the territory covered by the provisions of this act, is hereby prohibited, unless the same shall have been first inspected and passed inspection and marked with the marks herein provided for. Any person who shall sell, expose, or offer for sale, for food, any such beef, mutton, lamb, veal, pork or smoked meats, contrary to the provisions of this act, shall be deemed guilty of a misdemeanor, and upon conviction thereof, shall be punished by a fine of not less than twenty-five dollars and not more than one hundred dollars, or by imprisonment not exceeding three months for each offense.

"Section 15. Any inspector who shall falsely tag, stamp or mark any animal, carcass or piece of meat, or who shall make any false certificate in respect thereto, shall be deemed guilty of a felony, and upon conviction thereof, shall be punished by a fine of not less than five hundred dollars, nor more than one thousand dollars, or by imprisonment in the state prison for a term of not less than one year nor more than three years.

"Section 16. Any person who shall counterfeit any tag, stamp or mark, used by an inspector, or who shall change any tag, stamp or mark placed upon any animal or meat by an inspector, to any other animal or piece of meat, or who shall affix any tag, stamp or mark to any animal or piece of meat without the authority of the inspector, shall be guilty of a misdemeanor, and upon conviction thereof, shall be punished by a fine of not less than twenty-five dollars nor more than one hundred dollars, or by imprisonment for not less than sixty, nor more than ninety days.

"**Section 17.** Each inspector is hereby authorized, and shall have full power and authority to enter all cars, buildings or other places of business, and to open all packages of whatsoever nature, kind or description, and examine the same, in the proper performance of his duties.

"**Section 18.** Nothing herein contained shall require the inspection of any meat from animals which have been inspected under the laws, rules or regulations of the United States, unless such meat is sold, exposed, or offered for sale, within the territory covered by this act, in which case the same shall be subject to inspection as herein provided.

"**Section 19.** Nothing herein contained shall require any person residing within the territory covered by this act to have any animal, or the product from any animal, slaughtered for his own use, inspected, and the meat from such animal shall not be subject to inspection hereinunder, unless sold, exposed or offered for sale within said territory.

"**Section 20.** Nothing herein contained shall be construed to require the inspection of salt, pickled or canned meats, of any kind, except smoked beef, tongue, ham, bacon, sides and shoulders.

"**Section 21.** In making the inspection of slaughtered animals herein provided for, each inspector shall particularly examine and test the head, liver, lungs, spleen and tongue of each animal slaughtered; and for better enabling him to do this, the butcher shall hang the same upon racks provided for that purpose in the slaughter house, where the slaughtering is done, immediately after the slaughter and removal from the carcass of the animal slaughtered, and each of said organs shall be marked by the butcher in such a manner as to be easily identified as coming from the carcass from which it has been removed, and said organs so placed shall remain there until after inspection by the inspector.

"At least one inch of the diaphragm or skirt of the carcass of each slaughtered animal shall be left on the animal slaughtered until the same has been examined, inspected and passed, and all the parietal pleurae, of the lining of the chest cavity, and the parietal peritoneum or the casing of the abdominal cavity, ordinarily removed in the process commonly known as 'stripping,' shall remain upon each carcass, and shall not be removed therefrom until after the inspector has made his examination and inspection.

"**Section 22.** Whenever any inspector shall condemn any meat after slaughter he shall saturate the same with such chemical agents as will prevent its sale for food.

"**Section 23.** All records, papers, documents and instruments herein provided for are hereby made competent evidence to prove the facts therein stated.

"**Section 24.** The said Board may from time to time require any inspector to give such other, further or additional bonds as it may deem best. It may from time to time provide, establish and put in force such additional rules and regulations for the carrying out of the provisions of this act as it may deem best, provided the same do not conflict herewith.

"**Section 25.** Any person infringing this action in any particular not heretofore specified shall be guilty of a misdemeanor, and upon conviction shall be punished by a fine of not less than ten dollars nor more than twenty-five dollars, or by imprisonment for not less than ten days nor more than thirty days.

"**Section 26.** The word 'person' whenever used in this act shall be considered and construed to include individuals, firms, corporations and their officers, agents, servants and employes.

"**Section 27.** All acts and parts of acts inconsistent herewith are hereby repealed.

"**Section 28.** This act shall take effect and be in force from and after the first day of June, A. D. 1897."

This bill was promptly killed by those interested in plants furnished with federal inspection. It was again introduced during the thirty-first session (1899) by Senator Chilton, but it was allowed to die in committee. It would seem wise to introduce a somewhat similar bill at the present time and while unfair in a way to the local butchers to exempt meat that had passed federal inspection, from state inspection, it would seem that this was the only possible way of bringing about any meat inspection. The fees indicated in this bill would undoubtedly cover the expenses of inspection. In the larger places undoubtedly there would be a surplus, and this could be used to help out the smaller places. Arrangements should, therefore, be made for all fees to go into a general state fund, and the inspection should be carried out under state officials and state inspectors.

"The primary object of meat inspection is the detection of danger to the consumer of meat offered for sale; its secondary objects are the protection of the public against imposition and fraud, and to aid in the suppression of diseases which are transferable from animal to animal.

"A general regulation of meat inspection is found at the present time in Germany, Belgium, France, Holland, Spain, Italy, Austria-Hungary, Roumania and Switzerland.

"All inspectors who are entrusted with the duty of meat inspection should be properly trained in their duties; a sound opinion on the fitness or unfitness of meat for food can only be expressed by one who has had a thorough training in meat inspection.

"The question is sometimes raised as to whether the inspector of meat should be a veterinary surgeon or a sanitary inspector. It does not appear necessary to argue much on this point until the preliminary one of the systematic inspection of meat is determined. Much may be advanced in favor of always employing a veterinary surgeon, provided he has had included in his curriculum of education a training in this particular matter. A sanitary inspector who has gone through a course of such training and an accredited examination may be for all practical purposes an efficient inspector. Probably the determining point will be that of expense, the larger towns, with extensive abattoirs, employing the former, the smaller ones the latter."

At present the typical country slaughter house throughout Minnesota is a dilapidated, dirty shed, with dirty floors and walls, covered with blood and other filth and carrying with it a typical and indescribable odor during the entire year, but especially during the summer. Still further, during the summer season the place is swarming with flies, and these flies come in contact with the hanging meat of the recently killed animal. A proper supply of water and sewage accommodations are the exception. Many of these places are located close to sloughs or small lakes or streams, and the offal or waste is thrown onto the surface of the ground in the rear of the building with the intent that it shall be carried into the water immediately or with the spring freshets. Too often, in spite of the rule of the State Board of Health prohibiting the feeding of offal to hogs, this practice is carried out in the rear of these filthy slaughtering places, the hogs being kept specifically for the purpose of acting as scavengers. The killing is often most brutal. The carcass sometimes hangs for several hours in this type of building. Rats and other vermin abound. Rarely would anyone who had been in the habit of eating meat continue the use of this kind of food after visiting one of these killing places during the hot summer weather.

It is worthy of note that the people are beginning to realize the importance of a good local meat supply. Acting under the "Offensive Trades" law (sections 2143-2146, Revised Laws of 1905), complaints have been made during the past two years against several filthy slaughter houses. In several instances, after a hearing of the case, the State Board of Health has ordered the closure of these places. Quite generally this order has been observed without further action. In one instance an appeal was carried to the courts, which sustained the findings of the State Board of Health, thus closing up the slaughter house. In another instance an appeal from the order of the State Board of Health to close a rendering establishment was carried to the supreme court, where again the action of the State Board was sustained.

All cities and villages throughout this state should provide for a public abattoir. Such a place might be held by an individual or by individuals, or it might be a municipal plant, as is the case to a large extent in foreign countries. Germany is probably the best organized country so far as relates to the municipal or public abattoir, and while there is originally a large outlay in many of these German plants, still these institutions are financially successful.

> "There can be no possible doubt but that it is the business of municipal authorities to improve the sanitary condition of a town. Among such improvements we must count the erection of an abattoir."

The public abattoir is a sanitary institution from every point of view. If a sanitary institution of this kind is the property of a municipality, its management should be above suspicion, and, further, those who use it should have the benefit of the latest modern appliances and improvements.

> "At the present time Germany has 900 public abattoirs. These are established in all the larger towns without exception and even in small communities numbering as few as 1,250 inhabitants, well arranged public slaughter houses are found.
>
> "The requirements of modern sanitation are scrupulously complied with in obedience to police regulations; the flooring is impervious, the water supply ample and proper arrangements made for drainage."

The question as to where an abattoir should be located is important. Such a building should be of easy access for the butchers and should be located on ground where it is possible to secure good drainage. Such a site should be chosen that private houses cannot be built near the slaughter house and that the buildings may be enlarged without difficulty. A judiciously-appointed and well-arranged slaughter house should have no odor; every possibility of annoyance to the neighborhood must be absolutely avoided. Weight must be laid on the predominating direction of the wind, in order to avoid the bad odors as far as possible. In Germany the size of the building is based upon the population and is as follows:

For towns of from 5,000 to 7,000 inhabitants, 4 square feet to each inhabitant.

For towns of from 7,000 to 10,000 inhabitants, 3½ square feet to each inhabitant.

For towns of from 10,000 to 50,000 inhabitants, 3 square feet to each inhabitant.

For towns of over 50,000 inhabitants, 2½ square feet to each inhabitant.

It is difficult to determine the number of animals killed in cities and villages of various sizes, but it is safe to assume, I presume, that more are killed in Minnesota than in Germany, as we are more given to meat eating. The following table (Osthoff's) shows the proportion of animals killed to the population of a town:

Population		Oxen		Young Animals			Pigs		
	Number Killed Yearly	Daily Average	Largest Number Killed	Number Killed Yearly	Daily Average	Largest Number Killed	Number Killed Yearly	Daily Average	Largest Number Killed
5,000	600	2.0	4	1,800	6.0	12	900	3.0	9
6,000	720	2.4	5	2,160	7.2	15	1,080	3.6	11
7,000	840	2.8	6	2,520	8.4	17	1,260	4.2	13
8,000	960	3.2	7	2,880	9.6	20	1,440	4.8	15
9,000	1,080	3.6	8	3,240	10.8	22	1,620	5.4	17
10,000	1,200	4.0	8	3,600	12.0	24	1,800	6.0	18
12,000	1,440	4.8	10	4,320	14.4	29	2,160	7.2	22
15,000	1,800	6.0	12	5,400	18.0	36	2,700	9.0	27
18,000	2,160	7.2	15	6,480	21.6	44	3,240	10.8	33
20,000	2,400	8.0	16	7,200	24.0	48	3,600	12.0	36
25,000	3,000	10.0	20	9,000	30.0	60	4,500	15.0	45
30,000	3,600	12.0	24	10,800	36.0	72	5,400	18.0	54
35,000	4,200	14.0	28	12,600	42.0	84	6,300	21.0	63
40,000	4,800	16.0	32	14,400	48.0	96	7,200	24.0	72
45,000	5,400	18.0	36	16,200	54.0	108	8,100	27.0	81
50,000	6,000	20.0	40	18,000	60.0	120	9,000	30.0	90

In Germany the slaughtering fees for cattle are from $1.25 to $1.50; for pigs, 35c to 70c; for calves, 25c; for sheep, 12c. In England the slaughtering fees are: For cattle, 25c to 35c; calves, 6c to 12c; sheep, 2c to 6c.

The question of humane killing is one that is also deserving of consideration. It is rather strange that the societies for the prevention of cruelty to animals have not taken more interest in this matter. The killing in the ordinary country slaughter house is often most brutal, and even in the great packing houses throughout America the killing is brutal to a great extent. The English authority Cash, in speaking of this matter, says: "The American meat factory is in no sense an abattoir. The abattoir has, indeed, for its essential object the prevention of those very abuses which have made the American meat factory a by-word in the civilized world."

A committee in England appointed to investigate and report upon the need of abattoirs, speaking of this very matter, states:

> "The committee condemns—and, as I think, rightly—the Jewish method of slaughtering, but as long as the English people fail to insist that their smaller animals shall be killed as humanely as possible, they are not justified in criticizing others. The Jewish authorities, moreover, have carefully investigated the subject, and whilst keeping within the limits of a ritual which they hold to be essential, take certain precautions to avoid additional suffering. We kill callously for no better reason than that it is the custom of the trade, and in the name of common humanity it behooves us to set our own house in order without a moment's delay."

I have not been a common observer of butchering, but of the little I have seen I never saw more brutal butchering than that observed under the

Jewish rites in the great abattoir in Paris. The death of an animal should be made as painless as possible. The English Societies for the Prevention of Cruelty to Animals have taken quite an interest in this matter. In many countries in Europe it is now illegal to kill an animal without first stunning it. Still further, there are in use abroad killing apparatus which take the place of the pole-ax or the sledge that is so generally used in this country in the killing of cattle. The shooting apparatus quite extensively in use abroad brings quick and sure death.

A permissive law should be passed by the present legislature providing for the construction of municipal abattoirs or private abattoirs under municipal control, and if the municipality is to take the matter up provision should also be made for the issuing of bonds. I presume it will be impossible to secure any state legislation looking to the proper inspection of meats unless the meats that have already passed federal inspection are made exempt. The German slaughter house laws cover the following points:

"Any community which has erected a public abattoir may decree that within the boundaries of the whole community, or any part of it, the slaughtering of all, or any species of cattle, together with certain subsidiary occupations connected therewith, shall be exclusively carried on in the public abattoirs.

"After the erection of a public abattoir, a local by-law may enact that all cattle admitted into it are to be examined by qualified experts both before and after being slaughtered.

"The above enactments must be ratified by the local government board. The law prohibiting slaughtering to be performed elsewhere than in the public abattoir comes into force six months after the law has been published, unless a clause has been specially inserted, stipulating that a longer period shall elapse.

"The community is bound to manage and maintain the public slaughter house in such a way as to meet local requirements.

"The corporation has the power to levy dues for the use of the abattoir and the inspection of cattle, which dues shall be fixed for at least one year ahead.

"The amount of the dues levied is to be such that the dues for inspection cover the expenses thereby entailed, while the dues for the use of the abattoir must not exceed the amount required for the cost of maintaining the establishment, defraying the current expenses, paying interest on the capital outlay, supplying a sinking fund, and meeting any charges for indemnification which may be incurred.

"A higher rate of interest than 5 per cent, or a higher percentage than 1 per cent for the sinking fund, are not allowable.

"No one can be refused the use of the public abattoir.

"All leases and contracts expire at the end of the period specified above.

"Whoever shall perform slaughtering, or carry on any avocation connected with slaughtering, elsewhere than in the public slaughter house, shall be liable for each offense to a fine of $15, or imprisonment.

"This law came into operation in the year 1868. In course of time, however, it was shown that the action of the law was evaded by having cattle slaughtered outside the district boundaries, and the meat brought into the towns for sale.

"In this way the prescribed inspection of meat was often evaded, and the law was supplemented by a further act in 1881, the purport of which was as follows:

"After the establishment of a public slaughter house local by-laws may enact—

"That the flesh of animals not slaughtered in the public abattoir cannot be offered for sale as fresh meat within the city boundaries until it has been examined by experts, for which a sum will be charged, which will be paid into the municipal purse.

"That in hotels and restaurants fresh meat which has been imported from a distance may not be prepared as food until it has been submitted to similar inspection.

"That both in public markets and butchers' shops the fresh meat of animals not slaughtered in the public abattoir is to be set apart when offered for sale.

"That in public markets belonging to the corporation only the flesh of animals slaughtered in the public abattoir shall be offered for sale.

"That persons who follow the vocation of butchers or meat dealers as their regular profession within the township, may not offer for sale the flesh of animals which, instead of being slaughtered in the public abattoir, have been killed at some slaughtering establishment situated within a certain radius defined by the local by-laws.

"That imported meat which requires inspection shall be submitted to the inspector, in the case of large cattle in entire quarters, in the case of smaller animals in entire carcasses with all the internal organs intact.

"That whoever shall slaughter cattle, or who shall carry on any of the avocations specified in the act, except in the public abattoir, and whoever shall be convicted of not complying with the regulations in the case of imported meat, shall be liable for every offense to a fine of $35 or imprisonment."

I have quoted quite extensively from a work by C. Cash, entitled "Our Slaughter House System." Valuable information bearing upon this point can also be secured from a book entitled "Public Abattoirs and Cattle Markets," by Dr. Oscar Schwarz, director of public slaughter house and cattle yards, Stolp, Germany.

H. M. BRACKEN, M. D.,
Secretary and Executive Officer.

STATE BOARD OF HEALTH

REPORT OF

Division of Epidemiology

TO

DECEMBER 31, 1910

H. W. HILL, M. D., D. P. H. DIRECTOR.

INTRODUCTION.

1. **Establishment**—The division of epidemiology was established by an order of the State Board of Health dated April 12, 1910, and taking effect at once.

The present director had been appointed epidemiologist Aug. 1, 1909.

Previous to the formation of this division the secretary and executive officer of the Board had immediately directed the epidemiological work, which was performed by the secretary himself or by special agents selected from various points throughout the state and from the laboratory staff; in many instances since September 1905, by the present director of this division, and since Aug. 1, 1909, almost wholly.

Dr. A. J. Chesley joined the division as epidemiologist on part time in December, 1910, being appointed on full time Jan. 1, 1911.

2. **Duties**—The regulations adopted for the internal government of the Board, dated April 12, 1910, defines the duties of this division as follows:

"(a) To record, tabulate and study official reports of communicable diseases within the state, and to investigate unofficial reports thereof.

"(b) To make field investigations of the existence, prevalence, source and modes of spread of all these diseases in outbreaks within the state, and to report the findings promptly to the executive officer of the State Board of Health. Recommendations for abatement shall be made to the executive officer after consultation with other divisions concerned.

"(c) To make special investigations of obscure or unknown factors in investigative and remedial epidemiology for the general advancement of the science.

"(d) To furnish other divisions of the Board on request such information or technical assistance in epidemiology as may be essential to their work.

"(e) To prepare for the division of publicity, and the medical and technical press, such general information or contributions to science as may advance the work of epidemiology in relation to the public health."

3. **Objects**—This division exists to secure a complete knowledge, general and specific, of the communicable diseases; and to apply that knowledge to the study of the control, abatement and final abolition of those diseases in Minnesota. Its work is therefore strictly investigative and analytic and it possesses no administrative or remedial authority.

4. **Equipment**—Like the vital statistics division and unlike the laboratory and engineering divisions, which require technical apparatus as well as trained workers, this division requires practically only trained workers. The equipment of epidemiologists consists chiefly in a wide range of information and training, including ability to arrive at—

(a) **Individual Diagnoses**—i. e., the recognition of cases of the communicable diseases at every stage and in every degree of severity or mildness—both by clinical methods and the aid of laboratory work.

(b) **Individual Prognoses**—Not relating to the patient's welfare, but to the welfare of the community as affected by the patient. These involve a knowledge of the activity of the infective agents of each disease, the length of time they may remain communicable, and the specific dangers of spread in each individual case.

(c) **Individual Etiology**—The determination of the immediate cause of the individual case, the source of the individual infection and its route in reaching the patient.

(d) **Individual Therapeusis**—Not the treatment of the patient for his own welfare, but such conduct and handling of the case as may prevent spread to others.

Although the individual case furnishes the essential primary data of epidemiology, the sum total of the cases of communicable diseases constitutes the true epidemiological field. A specific outbreak of any one disease is the unit with which epidemiology deals.

Concerning this unit, the epidemiologist must determine—

(a) **The Epidemiological Diagnosis**—What the disease is, its biological incidence on the population, i. e., the age, sex, and nationality of those affected, the locality distribution (household, neighborhood, community, disseminated); its distribution in time and space, as massive, scattered, explosive, slow-spreading; its composition, as of unrelated cases or foci, consecutive cases or foci, contemporaneous or serial cases derived from one source, or of one or more of these in combination; its form as epidemic, endemic, prosedemic or sporadic—and the source or sources in each instance. In practice the obviously imported and secondary cases must be first letermined, the remaining or "primary" cases furnishing the practically important evidence as to composition and source.

(b) **The Epidemiological Prognosis**—i. e., the probable future course of the outbreak, its probable waxing or waning, its probable future distribution, etc., together with the reasonable effect to be expected from treatment; not the treatment of the disease, but of the outbreak.

(c) **The Epidemiological Etiology**—The ultimate origin of the outbreak; the route from source to patient; the sociological, biological and other factors involved.

(d) **The Epidemiological Therapeusis**—The immediate measures required to stop, abate or modify the outbreak. Permanent measures for prevention are not strictly epidemiological work, although, as in the practice of medicine, so in the practice of epidemiology—the efforts made to achieve a diagnosis usually result in the acquirement of the data for treatment also.

5. **Subdivisions of Epidemiology**—Epidemiological work falls naturally into two main subdivisions. These are field epidemiology and statistical epidemiology. Both are interpendent and supplementary, yet the immediate objects, and especially the methods of each, differ markedly. Field epidemiology is concerned with the initial collection of the data, interpreting it as it bears on the local conditions and deducing from it the needed forms of immediate relief. Statistical epidemiclogy deals less with practical detailed application to imminent individual problems and more with the accumulated data of many epidemics. It compares one epidemic with another, classifies them, contrasts outbreaks of one disease with outbreaks of other diseases. It concerns itself with the principles of epidemiology as well as with applied or field epidemiology. In short, statistical and field epidemiology relate to each other very much as do strategy and tactics.

Emergency Versus Local Routine Field Epidemiology—The field work may be further divided into emergency epidemiology and local routine epidemiology. The data, the methods, and the objects sought in both are the same, but the conditions under which they are applied are quite different.

Emergency field epidemiology is done in the face of an already established outbreak, usually by an expert acting for the community invaded during that emergency alone, dealing with the one disease concerned and working under pressure, against time, to cut short an already serious situation.

Routine epidemiology applies the same methods to the same ends, but continuously, **day after day**, systematically, methodically, without haste and in great detail, **case by case** to **every case** of **every communicable disease as it occurs.**

This concurrent epidemiology, therefore, properly conducted, would prevent the development of serious outbreaks. The spectacular and fascinating practice of emergency epidemiology will probably never become wholly obsolete, but local routine epidemiology should make the need for its use very infrequent. Were local health agencies adequately planned, financed and manned, local routine epidemiology would be their most important investigative work concerning communicable diseases.

Under the existing systems, however, the smaller communities and rural districts are practically dependent on the shrewdness and conscientiousness of the local physicians, often wholly untrained in epidemiology and in any case usually without authority, or facilities or time to make the proper investigations or the proper corrective changes. Until every community, large or small, is thoroughly policed by local routine epidemiology, outbreaks of various types will continue and the struggle against disease will remain an irregular spasmodic reaction, succeeding only in cutting off the tops of the epidemic waves.

6. **Remedial Epidemiological Measures**—Whether based upon emergency or routine epidemiology, remedial measures may be divided into emergency or permanent. Both must be based upon epidemiological evidence—the former on the immediate local necessities of the moment, the latter on broader lines traced deeper into the foundations of sociological conditions. The infectious diseases are spread by the spread of infectious discharges—and emergency measures are devoted to abolishing the spread of the particular infectious discharges acting at the moment. Permanent measures should contemplate the prevention or spread of any discharges, whether infected or not—at least, along the lines discovered in the outbreak investigated.

It would seem that the exchange of human discharges should be prevented along every line without waiting for disease to develop, but usually the only action that can be secured or enforced relates to those lines specifically pointed out as dangerous by a specific outbreak in the particular community concerned.

Under emergency methods may be classed:

(a) Isolation of the patients found, to prevent further secondary spread. "Isolation" should include proper disinfection of discharges, proper examination and disinfection of associates, proper restrictions on attendants, etc. In certain cases and under certain conditions screening the patient's room, reconstruction of toilet facilities, even the removal of the patient to hospital may be included.

(b) Measures for killing existing infection in the primary source and for preventing further contamination. These may involve boiling the water, disinfecting it, etc., pasteurizing milk or removing it from the control of existing handlers; abolishing flies; detecting and removing from the field of operation carrier or convalescent or other individual infectors; revising methods of handling foods, disinfecting infected dwellings and contents, etc., each measure being devised to meet some specific danger detected.

Under permanent measures lie:

(a) Permanent purification or even reconstruction of a water supply.

(b) Permanent reformation of milk supply.

(c) Introduction of medical school supervision, of visiting nurses, of new and efficient board of health procedures.

(d) Introduction of new sewage disposal methods; of garbage or manure removal, drainage of swamps, etc., etc.

(e) Public instruction of the people in general, personal hygiene—lectures, exhibits, courses in public schools, etc.

(f) Establishment of isolation hospitals, and general or even compulsory use of prophylactic inoculations.

While emergency relief measures flow naturally from the immediate findings of the epidemiologist and should be at once instituted, neither emergency nor permanent measures are the work of the epidemiologist as such. Although based on epidemiological evidence, relief measures, especially permanent measures, involve special technical training and special technical procedures beyond the epidemiologist's functions. They are administrative, not investigative, in character. The laboratory man, the engineer, the trained hospital superintendent, the physician, the nurse, the police, the boards of health and of education, schools, colleges and universities, the judiciary and the legislature must participate in some degree, to furnish needed men, money, information or work.

Epidemiology really performs the scout corps duty for the public health forces, "feeling out" the enemy, determining his numbers, position and attachments, and thus furnishing data for the campaign. The scout corps may and should, when possible, restrict the movements of the enemy, cut off his base of supplies and keep him in **statu quo** until the main army can act. The whole mechanism of local government, directed by the public health administration, constitute this army, and it is on governmental administrative action that the permanent uprooting and destruction of the enemy depends.

7. Relation to Other Branches of Public Health Work—

Relation to Administration—Much of the administrative work of a public health department relates only indirectly to epidemiology. True, the ultimate object of health departments is the control and final elimination of disease, and at the present time particularly of the communicable diseases, but health department administration is necessarily largely concerned with remedial and preventive work, the investigative work of any division being done in order to discover when and where, sometimes what and how, remedial and preventive procedures should be instituted. Epidemiology furnishes the basic data for the communicable diseases and is limited to discovering and unraveling the ramifications of the relations of case to case, of infector to infectee, and to the discovery of the sources and routes of infection in the outbreak or community with which it deals. Once this is done, and the results reported to the administrative authorities, its functions technically cease. In practice it is true that the epidemiologist, like other technicians, must usually interpret his technical findings, and since the very work of tracing the source and routes of infection necessarily discovers or indicates the measures for abatement, the field epidemiologist should not only usually advise, but if properly authorized by the administrative authorities may often order or even carry out necessary immediate emergency measures. Such administrative procedures, however valuable, should not be confused with nor allowed to displace or divert the real epidemiological function of tracing the source and routes of infection. One of the greatest drawbacks to public health work as now conducted in most communities of this country is the loading down of those who should devote themselves to epidemiology with routine administrative duties such as installation of quarantine, release, disinfection, record keeping, etc., etc. Indeed, the average health officer performs the latter duties almost to the exclusion of the former—inverting the proper relations, hence making little or no progress, or even achieving actual disaster.

Relation of Epidemiology to Vital Statistics.

Epidemiology, like sociology, political economy and actuarial work, may use with advantage such results of vital statistics as bear upon its own field, and especially it may profit as may others having to do with statistics, by the use of vital statistical principles and methods—but its chief relation to vital statistics is that of a collector and sometimes interpreter of special data in a particular field.

Field epidemiology, whether emergency or routine, collects for its own purposes and deals with at first hand a part of the data required by the vital statistician—but a part only—that relating to the prevalence and distribution in time and space of the cases of communicable diseases.

Emergency epidemiology can furnish such data only concerning a particular outbreak of a particular disease in a particular community.

Concurrent epidemiology contrasts in this regard with emergency epidemiology, in that it seeks to collect, analyze, interpret and apply all the data of emergency epidemiology, in **every** case of **every** communicable disease **every** day, **as it occurs.** The material thus collected should not only be complete for epidemiological purposes, but necessarily includes all and more than vital statistics now asks for, usually fruitlessly, in this field, from the physician and health officer.

The communicable diseases furnish only part of the data on disease and mortality which vital statistics as a whole considers and cannot furnish data at all, in a large part of the field covered by vital statistics as a whole. Nor are the objects of the vital statistics in collecting and publishing the data of even the communicable diseases identical with the objects of epidemiology in collecting them. Statistical epidemiology itself uses but a part of the information deducible from its own data, which with its multiple sociologic and economic bearings and relations must be dealt with by vital statistics.

The Relation of Epidemiology to Laboratory Work.

Epidemiology requires at times certain data which can be obtained only by laboratory work. The laboratory has many functions in various lines of technical investigation, and in its advisory capacity concerning the technical details of remedial measures, quite unrelated to pure epidemiology. The routine laboratory results which the epidemiologists may use are in brief those which tend to detect or indicate infection of certain possible sources or routes of infection—cases, carriers, convalescents, infected water, milk, etc. At times, epidemiological investigations may remain indecisive until laboratory examinations can confirm or reject one or more of the possibilities pointed out. On the other hand, epidemiological results, in so far as they reveal the specific source and routes of infection are not of value to laboratory work, except as the data obtained bear on the interpretations of laboratory results or suggest lines for certain laboratory investigations. Positive laboratory findings must, however, usually be interpreted in the light of epidemiological data, and negative findings are in most instances of little weight, unless repeated many times.

Relation to Engineering—Epidemiological work requires at time information of an engineering character in tracing or demonstrating devious natural or structural paths along which concealed contamination may enter water supplies unnoticed, and in devising emergency measures for purification of water supplies, sewage disposal, etc. As already pointed out, permanent measures of this kind are practically wholly in engineering hands except that they must not fail to meet the necessities demonstrated by epidemiological work.

The engineer receives epidemiological aid chiefly when considering water supplies which inspection and analysis do not free of suspicion. In such cases the question whether the suspicious or contaminated supply actually produces disease can only be answered by epidemiological work, sometimes only after a prolonged and exhaustive, practically house-to-house investigation.

Relation of Epidemiology to Sociology—Epidemiology relates more closely to sociology than to any other one science. There is little concerning man or his activities, physical surroundings, biology, physiology, pathology or social relationships unrelated to epidemiology in its broad sense. Almost all the sciences furnish some one or more factors in epidemiological work. Bacteriology, clinical observation and mathematics have supplied the bulk of its technical armamentarium, however.

8. **Epidemiology of the Future**—The greatest stumbling blocks to epidemiology, emergency and concurrent, are lack of knowing at the earliest moment where the cases are, and lack of equipment on the part of most boards of health as now constituted to investigate them properly if they were known. The continuation of the infectious diseases in spite of the measures now in vogue is due to:

(a) Non-recognition of the disease in its early stages by the laity—sometimes even by the physician, when called.

(b) The existence of light cases, to which a physician is not called at all.

(c) The concealment of cases, after recognition, by the laity—sometimes even by the physician.

(d) Ignorance on the part of the laity of the dangers involved in a case of infection—belief in sewer gas, damp cellars, aerial transmission, spontaneous generation from a run-down system, etc., as the source—and consequent non-recognition of the real avenues of infection.

(e) Lack of, or imperfect, instruction in the sanitary care of infectious cases by the physician.

(f) Disbelief on the part of the laity—sometimes of the physician—in the knowledge or ability of those in authority to aid in the suppression of infection. This disbelief is, unfortunately in some individual instances, not wholly without foundation.

(g) Lack of facilities, as well as knowledge and training, amongst those who must usually act as attendants to the sick. Approximately 95 per cent of all infectious diseases are nursed by wives and mothers at home, i. e., without proper facilities, and the average mother is far from being a highly trained, sanitary nurse, however willing, conscientious or self-sacrificing.

(h) Lack of facilities by the authorities for making proper provision for the public care of infectious diseases at their homes or in hospitals.

(i) The greatest obstacle, however, is at the bottom the lack of minute specific individual governmental handling of each case—epidemiological and restrictive.

Remedies for these conditions lie in—

(a) Much more complete notification of the occurrence of infectious diseases, both frank and suspicious cases, by the laity as well as by the physicians.

(b) Much more complete equipment of health authorities in men and money in order that local routine epidemiology—the study of each case as it occurs, with its personal history, contacts and associates—may be carried out—as well as the proper isolation, etc., of the patient at home or in a hospital.

(c) The complete financial relief of the invaded family by the community, through the public health administration—such that losses may be minimized and especially all direct charges obviated. Until this is done delay or refusal to call a physician on the part of the laity in light or early cases, the basic obstacle to advance, will continue.

9. **The Scientific Basis for the Data Sought In Epidemiological Field Work**—Since the basis of infection—the absorption of infected discharges from previous cases—is the same in all diseases, the individual communicable diseases each require the same sort of epidemiological investigation, modified, **secundem artem**, to fit the particular disease, yet covering practically the same fields of inquiry—the search for the next preceding case in lineal descent. The knowledge of what discharges are harmful in each disease and the routes of these from infector to infectee is absolutely essential for epidemiological work.

Sources—Communicable diseases in general have their source in an antecedent case, and do not develop from "bad surroundings" or any other form of spontaneous generation. The reportable diseases of this state may thus be classified on the basis of the actually dangerous material discharged by each:

(a) **Contracted chiefly* from infected discharges of the nose or mouth** of the previous case (human or animal); tuberculosis, diphtheria, scarlet fever, smallpox, chicken-pox, measles, leprosy, epidemic cerebro-spinal meningitis and human glanders. Tuberculosis may also be contracted from infected animals—usually the infected milk of cows—the seriousness of this source being in dispute, but admittedly not negligible. Human glanders is contracted from the nose discharges of horses and at times from the tissues of the infected horse, implanted on wounds or on human mucous membranes. Rabies is peculiar in that while the human case is almost exclusively derived from the bite of an infected animal, subsequent spread from the human is quite negligible. Tetanus, usually derived directly or indirectly from the bowel discharges of well horses inoculated deep into the tissues, practically never spreads further from the human.

(b) Contracted from infected discharges from the outlets of the bladder and bowels. Typhoid fever, gonorrhea, and some cases of tuberculosis.

(c) Spread by infectious discharges from the eyes, trachoma.

(Syphilis, not yet a reportable disease in this state, but a pressing problem of the near future, may be contracted from infected nose and mouth discharges and from certain skin lesions, notably the initial lesion. This is the only disease of this part of the country which is ever truly hereditary.

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*(It is true that smallpox, chickenpox, leprosy, human glanders and tuberculosis of the skin may be spread from the skin lesions, but in practice the chief sources of infection are as above stated.)

These infected discharges (excluding the venereal diseases) are received into the body of the prospective victim chiefly by way of the mouth and nose—the rare exceptions constituting an unimportant factor in the general problem.

The general statement, therefore, holds true that the infectious diseases are spread chiefly by the transfer of discharges from orifices of the infected body to orifices (chiefly the mouth and nose) of the prospective victim—and that were infected discharges prevented from entering the mouths and noses of well persons, the ordinary infectious diseases (except syphilis and gonorrhea) would become great rarities and finally disappear.

Routes—The routes by which these infective discharges reach the mouth of the prospective victim are by the way of things which touch or enter the mouth and nose. These primary or direct conveyors are therefore air, food, drinks, eating utensils, bedding, towels and hands; but also tooth-brushes, hairpins, money, pencils, pipes, cigars, chewing gum, money, etc., etc. Actual contact of mouths with infected mouths, as in kissing, etc., and the similar but more distant direct transfer of mouth discharges in the form of mouth spray, as in close face to face conversation, etc., must be included.

Secondary or indirect conveyors are those which carry infection to the primary conveyors, hence chiefly hands and flies. In trachoma, flies may act as primary conveyors. Air and water are usually primary conveyors. The other primary conveyors may occasionally act as secondary conveyors. Hands act in both capacities.

Much thought, discussion and experiment have been devoted to defining the relative importance of these avenues. The chief factors governing their relative importance may be stated as:

(a) The relative frequency of the infection of each thing.

(b) The relative frequency with which mouths are touched or entered by each.

(c) The number of people likely to be affected by the same individual infected thing. Thus, the radius of infection possessed by an infected hand is governed by the number of persons with whom that hand comes into relation and the directness or indirectness of the relation. An infected milkman's hand may produce a neighborhood or community outbreak—the infected hand of a housewife threatens her whole household. The infected hand of a bookkeeper usually threatens but one or two people.

The direct damage done from an infected water supply correlates with the limits of the population using the supply—which may be very small or very large.

(d) The intimacy and length of the contact of each with the mucous membranes.

Hence the relative frequency of the occurrence of instances in which infection is carried through water, food, milk, etc., must be distinguished from the number of cases resulting from each such instance. On this basis, hand transmission of the communicable diseases is probably by all odds the most frequently acting form of transmission, occurring every day all over the state; yet only one or a few cases is likely to result per instance; the comparatively rare instances of milk or water infection are likely to yield large numbers of cases per instance.

These quantitative considerations belong to statistical epidemiology, and can never be placed upon sound quantitative foundations until field epidemiology, especially of the concurrent form, becomes firmly established as a routine practice. Then, and then alone, will the data be available not only for local and immediate needs, but also for statistical and sociological studies, and the obtaining of reliable generalizations for shaping the great currents of human action, custom, procedure and law.

The field epidemiologist's prime business is to trace the exchange of human discharges through the community by observing the points at which its effects become evident; guiding himself in his search by the principles above laid down—and directing the epidemiological remedial agencies to the points of eliminating the infectiousness of the discharges and of preventing their further dissemination.

10. **Specific Epidemiological Schedules**—Since the initial procedure of the epidemiologist is the collection of detailed individual data concerning all infected persons, the consideration of this data, its form and scope is of fundamental importance. Yet it must be remembered that no set schedule has been—or probably can be—devised which will not at times prove redundant at others inadequate. Nor will precision of question be met by precise or even understanding answers. Hence, to the trained epidemiologist these schedules are but remembrancers. To the untrained investigator, unappreciative of the significance or relative value of the questions and of the form which answers must take to mean anything, the schedule forms but an awkward tool, wearisome and likely by its very exhaustiveness to retard rather than help.

The essential threads to be followed have already been given. The infectious diseases are transmitted chiefly through the discharges of infected persons—and the infected persons in a community, in order of average importance, are: The frank cases, the light ambulatory cases, the well but infected persons infected from these, and finally the casual infected persons who as carriers exist in all communities to a greater or less degree, their source of infection usually being unknown.

While the average relative importance is as above stated, circumstances may combine to make even a casual carrier the central point of an outbreak, while the existence of numerous unrecognized carriers may overbalance in importance a relatively few recognized and isolated cases. In general, however, the frank cases are the focus point from which radiate diminishing zones of danger. These zones thin out and overlap, and may establish new foci, each with its own zones, and so on **ad infinitum.** In practice the control of the main foci, with correlative attention to the various surrounding zones in proportion to their diminishing importance, will enable control of the whole situation. If this were not true—if every infected associate and every casual carrier were as serious a problem in spreading disease as a frank case, public health measures would be absolutely unavailing and, indeed, uncalled for, since there would be a perpetual epidemic of every disease in all communities to an extent which would paralyze all activities and gradually decimate the race.

The following is a classification of the principal data sought:

(a) **Identification Data**—Initially to identify and locate the patient, it is obvious that these are also of the greatest importance to field and statistical epidemiology and ultimately to sociological study.

Patient's name, sex, age, nationality, occupation; married or single; present residence; name and address of attending physician; patient's home, i. e., residence when taken sick; head of household; relation of patient to head of household; ages, sex, present addresses of other members of household.

(b) **Partial Clinical Data**—The whole medical history of the case interests the epidemiologist because he must study and understand the natural history of the disease under his care in every detail, especially as regards diagnosis at different stages. But these details are not of value in determining the source of the infection or how to prevent further spread, except indirectly and in certain diseases, tuberculosis and syphilis particularly. Even in these the epidemiologist's interest is confined chiefly to determining from the stage of the disease and the condition of the patient how infective he is and what and to what extent preventive measures should be employed. The acute infections are infectious from the onset of prodromes until complete recovery, and often remain infectious for variable but considerable periods thereafter. The chronic infections, notably tuberculosis and syphilis, pass through various stages of infectiveness and non-infectiveness as the disease develops or is modified by treatment. In such diseases, the stage of the disease, its present condition and its probable future development should be recorded. In all diseases certain dates are important—first as fixing the date of infection—the crucial datum-point on which to base all the investigation—and as fixing the dates of the maximum and other degrees of infectiveness of the patient, the degree of restriction of the patient during these stages, etc., all of which tend to identify the part played by this patient in the general outbreak.

Date first seen by a physician.
Date of diagnosis.
Date of going to bed.
Date of report.
Date of earliest symptoms.
Nature of these.
Date of infection.
Previous attack of same disease.
Date of beginning infectiveness.
Date of beginning precautions against spread.
Date of release of restrictions.
Hospital address.
Date of removal to hospital.
Date of discharge therefrom.
Condition of infectiveness on discharge.
Date of complete convalescence.
Artificial immunizing inoculations.

(c) **Source and Routes of Infection**—Although the foregoing data tend directly or indirectly to the tracing of the source of infection, the following are specifically related to this point:

Food, water, milk, environment, associates and activities of patient at and about date of infection.

Specifically, as regards food, water, etc., usual and unusual supplies, at work, at home and elsewhere, their derivation from infected sources, their handling by infected persons during transportation, preparation for the table, at meals; infection by flies at any stage; also the extent which the same foods, etc., were used by others, and the effects of such use on them.

Environment: Usual and unusual, trips away from home, rooms occupied, buildings visited, clothes worn (laundry infection, infection through bed clothes or common towels, etc.); also the extent to which others have shared in these activities or utilities and the effect on them. General sanitary conditions of places occupied, toilet accessories, screened windows, overcrowding, etc.

Associates: Usual and unusual; at home, at work, at church, Sunday school, social gatherings, etc., during traveling, guests, hired help (especially those having to do with food or drink, or other intimate contact), i. e., cooks, waiters, milkers, fellow boarders, room-mates, barbers, etc., i. e., all giving personal service or coming into personal relation.

Particularly all associates sick in any matter or associated with those sick in any mânner, together with the names, addresses and other details concerning them. Association with animals, especially diseased animals, in cases of tuberculosis, human glanders, poliomyelitis, etc., should be noted. Infection may occasionally be carried by insects, cats and dogs and this should be kept in mind.

(d) **Data Concerning Further Spread**—The epidemiologist, while concentrating first on determining the source of infection of the patient under consideration, must not fail to regard him as a new focus of infection as well as the result of previously existing focus. Hence, while the foregoing data gives the personal history, associates, etc., of the patient **at the date of infection,** and hence covers the possibilities of the patient's exposure to previous infection, it is further necessary to secure the same kind of data **covering the period of the patient's infectiveness,** hence covering the possibilities of the exposure of others to the patient. The specific facts obtained under this head may or may not be identical with the proceeding, depending on the movements and activities of the patient between infection and onset. In all cases, previous attacks of the same disease conveying immunity or artificial immunity from protective inoculation amongst associates should be determined.

Certain special occupations are more likely to distribute infection on account of intimate relationships involved or on account of handling of food stuff, than others, and special inquiries should be made in all such cases. These are: Teachers, school janitors, butter handlers, milkers, handlers of raw food stuffs in general, salesmen in grocery stores, barbers, tailors, laundry workers, domestic servants, cooks, waitresses, etc.

Handling of food or drink, especially milk or other raw foods, for others by patient during incubation period, during prodromes; during frank attack; during convalescence; since; with effect on those using same. Intimate associates, at home, at work, etc., especially room-mates, nurses, attendants and keepers during these periods, with effect on these; usual and unusual activities, trips, etc., during these periods; usual and unusual disposal of discharges (nose, throat, bladder and bowel) during these periods; toilet facilities, use of common towels, etc.; school activities, use of common toilets, pencils, books, modeling clay, etc.

Although all the classes of data given above should be collected for each of the infectious diseases investigated, variations in the emphasis given may be advisable in different diseases, and in different outbreaks of each disease. Thus, although the **identification data, partial clinical history** and **data on further spread** should be obtained in every case of every disease, the **source and routes of infection data** are very important in smallpox, diphtheria, scarlet fever and typhoid; less important in tuberculosis (although by no means to be overlooked), since the lapse of time since the infection is generally so great in the latter disease between that the source, if identified, has often ceased to act, or can no longer be located. In tuberculosis the **data on further spread** is of crucial importance, while in human rabies it is negligible. In syphilis, rabies, human glanders, leprosy and gonorrhea the source of the infection is usually already known to the patient, although the actual location of the infector may be difficult or impossible. In anterior poliomyelitis, the mode of infection is as yet undetermined. Inquiry under this head for this disease is therefore in the nature of research work. In certain diseases also the sources of infection in some communities are at times so widespread that inquiries under this head are more useful in locating cases not theretofore reported than in identifying the particular infector of the case under examination.

A PLAN FOR THE ESTABLISHMENT OF LOCAL ROUTINE EPIDEMIOLOGIC WORK IN MINNESOTA.

The fact that physicians in practice cannot be expected to bear the financial burden of the local routine, epidemiological work, which should be done in every case of communicable diseases—and have no authority, facilities or time to do such work as it should and must be done to secure results—and the further fact that physicians in practice, even **when acting as health officers**, are most inadequately compensated at best, and although they have the authority, are no better equipped in the other respects, leads to the inevitable conclusion that such work must be done by trained men, properly compensated, having facilities and time for the purpose, as well as adequate authority; hence, that physicians, not in practice, should be appointed to do such work in the country districts. They should be subject to the approval of the state for appointment and to removal by the state on charges after hearing and investigation. Their duties in chief part should be: to visit each case of infectious disease as it develops, determine its source, take measures against further spread from the case itself, cut off further spread from the source found, and to report all their findings and procedures promptly to the State Board of Health for comparison and correlation with other similar reports from other similar officers, physicians in practice, etc., etc. Thus every case of infection in each locality would be promptly dealt with, adequately traced, infection followed to its source, complete returns made and proper data obtained for the co-ordination of the larger work of suppressing communicable diseases throughout the state. Such officers should particularly enforce all the regulations of the Board, particularly those relating to the sale of milk, butter, etc., from infected farms, the prevention of secondary spread on the farms, measures to suppress fly-outbreaks, etc.

Such public health officers, while they may possess many functions and powers, administrative, investigative and remedial, should be particularly charged with local routine epidemiology—the tracing of the source and routes of infection—in every case of communicable disease within their jurisdiction, and with the investigations needed to determine and prevent the likelihood of spread from the cases found. While taking all needed local (emergency) measures, isolation, prevention of school attendance, etc., as called for by the regulations, their initial and most important function would be the tracing and discovery of infection, the notification of the findings to the local and state administrative bodies, to the schools, Sunday schools, libraries, shops, factories, or other public utilities concerned, to the officers in abutting districts, or other districts involved, and to all agencies, such as district nurses, hospitals, etc., which may exist for or aid in the administrative control or the exercise of restrictive measures.

In brief their chief function should be at the time and under present conditions, epidemiological—and hence to familiarize themselves with the frame-work of the ramifications of the chains of infective discharges which propagate and keep alive communicable diseases in their districts; to find and act promptly on each focus which develops; and to unite and correlate all measures to prevent further development. To keep them free for this work they should not be charged with the operation of any permanent agency for control of such diseases as the operation of a laboratory, the care of a water or sewage purification plant, medical school supervision (except as relates to the communicable diseases) district nursing, the care or management of hospitals, the collection of vital statistics (other than of the communicable diseases). Should it be found necessary to combine in one individual both epidemiological work and the direct charge of some one or more of these mechanisms, he should be enabled by explicit instructions and regulations to clearly differentiate them, reporting to different authorities for each and maintaining co-operation rather than fusion between the different functions.

THE QUANTITATIVE DIMENSIONS OF THE COMMUNICABLE DISEASE PROBLEM IN MINNESOTA.

A preceding section showed that the communicable diseases are derived wholly from preceding cases of the same diseases, and almost wholly from preceding human cases. The whole practice of modern public health consists in the discovery of these infectors, and in preventing the further spread of disease to others from them. This may be accomplished by the isolation (in the broadest sense) of the infector and his discharges, by disinfection (in its broadest sense) of the routes of spread (as in purification of water); by the abolishing of the routes themselves (as in destruction of flies); or by the artificial protection of the prospective infectee (as in various forms of vaccination). All but the last involve the discovery of the infector and the discovery of the routes of spread.

Hence the problem of public health is initially the problem of finding the infected persons and then of so supervising them and their relations to the uninfected public as to prevent the discharges of the infected reaching the uninfected.

To demonstrate just how much of a problem this is in Minnesota, a table relating to seven prominent communicable diseases of this state long recognized as coming within the scope of public health authorities is given below. Several other communicable diseases exist, which are only beginning to be recognized as in the legitimate field of governmental investigation and control (syphilis, gonorrhea, pneumonia, summer diarrhea of children), while still other communicable diseases, although under governmental supervision, are omitted because of their relative numerical or other unimportance. That very much could be done in the suppression of these diseases, were the opportunity for the study of administrative ways and means available, is wholly probable. Meantime, however, the actual field even now fully recognized as calling for governmental control is very far from adequately covered because of lack of men and still more from lack of money.

TABLE SHOWING CERTAIN FACTS, CALCULATIONS, ESTIMATES AND SPECULATIONS CONCERNING SEVEN COMMUNICABLE DISEASES IN MINNESOTA.

	Annual deaths (average for 10 years)	New recognized cases annually calculated from death (round Nos.)	Mild, unrecorded and concealed cases (estimate)	Combined annual total of new dangerous infective persons (estimate)	Number of dangerous infective persons daily existing (round Nos.)
	Column 1	Column 2	Column 3	Column 4	Column 5
Tuberculosis (pulmonary)	1,756	1,800	(3)	1,800	2,700
Typhoid fever...........	402	10,000	5,000	15,000	3,750
Diphtheria..............	479	5,000	5,000	10,000	850
Scarlet fever...........	135	2,700	5,000	7,700	1,300
Measles.................	(1) 80	(2) 10,000	5,000	15,000	1,250
Whooping cough (7 years)	91	5,000	2,500	7,500	1,250
Smallpox................	26	5,000	5,000	10,000	1,250
Total..............	2,969	39,500	27,500	67,000	12,350

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(1) This figure is too low, indicating only deaths in the acute attack. Deaths attributable to measles run probably as high as scarlet fever or higher.

(2) An extremely conservative estimate based on the number of school and other children in the state and the proportion of these who have had measles.

(3) It is generally believed that for each annual death from tuberculosis, at least five living cases exist. In Minnesota, therefore, there would be in any one year about 10,000 cases (of which about 1800 to 2000 die during the year) while 1800 to 2000 new cases develop to take the place of those who die. For the purposes of this calculation these living cases are regarded as non-infectious, except that the 1800 to 2000 that die are regarded as infectious for the year and a half preceding death. These assumptions are probably nearly correct. It is difficult, however, to regard the 8000 living cases annually as mild, unrecognized or concealed. They can hardly be mild, as the tendency is to death. They are probably neither unrecognized nor concealed, but are known to physicians and not reported, simply because it is not the custom to do so. Undoubtedly there are great numbers of persons infected with tuberculosis in addition to these 10,000 in whom the disease never appears as any definite affection; these cases terminating in recovery within a few weeks or months after infection. Any estimate of the number of these would be futile. It may be worth noting that the Germans have a saying that "everyone has tuberculosis" while autopsy records seem to show that over one-half of the total bodies examined show traces of healed tuberculosis. The 10,000 living cases are therefore but a small number of the total persons infected, but they represent the only ones in whom the disease is a serious matter; while the 1800 to 2000 who die represent practically the only ones that are to be feared as infectious, and this number only for a year and a half of life on the average. When we speak of one infected case producing another, we mean that one such infected case produces one other serious case with a tendency to terminate in death. Undoubtedly every such case infects many such individuals who show no result or very trifling results from the passing infection.

	New persons becoming infective daily (round Nos.)	Persons daily ceasing to be infective	Average duration of infective period	Relative infectiveness per unit of time	Total months of infectiveness annually
	Column 6	Column 7	Column 8	Column 9	Column 10
Tuberculosis (pulmonary)	5	5	18 mos.	1	32,400
Typhoid fever	41	41	3 mos.	6	45,000
Diphtheria	27	27	1 mos.	18	10,000
Scarlet fever	21	21	2 mos.	9	15,400
Measles	41	41	1 mos.	18	15,000
Whooping cough (7 years)	20	20	2 mos.	9	15,000
Smallpox	27	27	1½ mos.	12	15,000
Total	182	182	....	....	147,800

COMMENTS ON TABLE.

Column 1. Shows deaths as reported, and is fairly reliable and probably fairly complete, except in the case of measles, where it is probable the deaths attributable to measles should be 100 to 300, instead of 80. It is the universal belief of all public health authorities that measles is more serious from the standpoint of fatality than scarlet fever.

Column 2. Indicates the number of recognized cases, as calculated by the known relative number of deaths to cases, the relative number (fatality) being based on professional information and belief, and on the figures obtained in specific outbreaks. Of course, the actual numbers of cases are supposed to be matters of official record, but the neglect by physicians of the duty of reporting such cases, and the existence of cases to which no physician is called, necessitates an estimate rather than reference to reliable records.

Column 3. This estimate of mild unrecognized and concealed cases, probably below the truth, is nevertheless somewhere near the truth. It is based on the general teachings of the leading public hygienists and on local investigations in specific instances.

Column 4. Is the total of all cases.

Column 5. Shows the average number of persons who are actually infective every day in the state. Thus the 1,800 cases of tuberculosis are infective for the 1½ years preceding the death of each (on the average), and hence on any one day 2,700 exist in an infective state. The 15,000 cases of typhoid are infectious for an average of three months each, and hence 3,750 are infectious on the average on any one day. To these should be added on at present quite unknown number of "immune carriers."

Column 6. Shows the new cases necessarily developing on the average each day in order to make the annual totals.

Column 7 is merely the correlative of column 6.

Columns 8 and 9 introduce what the writer believes to be a new method of determining relative infectiveness here described for the first time. It is conceded that these seven diseases are not markedly increasing or diminishing. Hence each case gives rise (on the average) to one new case. This infection is accomplished during the infective stage of each disease;

hence a case of tuberculosis spends 18 months in infecting a new case, while a case of typhoid accomplishes a similar reproduction in three months, a case of diphtheria in one month. The reasons for this variation in the infectiveness of these diseases involves considerations too speculative for discussion here. The main point of general interest demonstrated is that temporary relations with a tuberculosis patient involve on the average but one-eighteenth of the danger of infection which the same temporary exposure to a diphtheria case would involve.

In brief, then, the problem of communicable diseases in Minnesota, so far as the scope of public health authority is now understood, is not a vast overwhelming wave of limitless dimensions, before which we should abjectly bend, or at most struggle fitfully and hopelessly at odd times, but a very definite and quite limited business proposition, readily to be handled by a staff of men far smaller than that of many very modest factories, and calling for an investment far less than many moderate business enterprises require; the returns in actual savings of cash to the general public as the result of even very partial success promising annually easily ten times the annual investment.

Thus, of the 2,000,000 people in Minnesota, living 24,000,000 months of life annually, less than 4 per cent (3.4 per cent) spend 150,000 months (in round numbers), or five-eighths of 1 per cent, of the total time lived, in an infective state dangerous to others. To find and supervise these cases, 182 new cases must be located and supervision begun daily, while 182 cases must be released from supervision daily, and about 12,000 cases must be daily under official cognizance. If such intimate knowledge and control of these sources of infection as such discovery and supervision implies were had, they would infallibly reduce the cases of these diseases, at the most conservative estimate, by one-third. Sixty men devoting their whole time to this work could each manage three new cases daily, besides exercising supervision over 200 existing cases, and thus secure this result. The annual loss to the state from these seven diseases alone is at least $15,000,000 annually. To save one-third of this, or $5,000,000, **besides the health, life and happiness** now lost, would cost half a million dollars annually.

Minnesota, with a population of 2,000,000, spends as a state less than one-tenth the amount that Chicago, with its 2,000,000 population, spends on its health department; yet Chicago is a compact city, any part within easy reach of any other, while Minnesota is spread over 83,000 square miles of territory to add to the difficulties of administration. The usual argument, that a city from its very compactness furnishes vastly more opportunities for spread of infection and requires a very much greater mechanism to deal with its public health problems, is offset in this instance by a comparison of deaths from communicable diseases in Chicago for 1910 with the average deaths for ten years in Minnesota, showing that Chicago has only about double the actual number of cases.

	Tuberculosis	Typhoid Fever	Diphtheria	Scarlet Fever	Whooping Cough	Measles
Chicago....................	(1)3,812	302	340	367	175	176
Minnesota..................	(2)1,756	402	479	135	91	80

(1) Pulmonary and non-pulmonary. (2) Pulmonary only.

Hence the prevalence of these diseases in Chicago is, roughly speaking, about double that of Minnesota. Yet Chicago spends over ten times as much as the Minnesota State Board of Health. Moreover, Chicago finds that it must more than double its present expenditures if it is really to progress with the suppression of communicable disease, rather than as at present to continue the mere prevention of any decided increase.

ON THE TRUE AVERAGE PREVALENCE OF MEASLES AND WHOOPING COUGH.

In Minnesota there are 441,000 children attending school.

From the census reports of 1900, the age groups 0-19 years contain 46,000 (+) children per 100,000 population, or 920,000 (+) in the state. About one-half of these are under (260,000+) or over, (180,000+) school age.

In a list of 257 patients (reported in the polio. outbreak of 1909), data concerning the previous "children's diseases" of these children were given as follows:

No previous disease..........	144	Scarlet fever	21
Measles	63	Chickenpox	6
Whooping cough	60	Diphtheria	4

Hence approximately ¼ of these children had had measles, nearly ¼ whooping cough, about 1-12 scarlet fever, about 1-43 chicken-pox, about 1-64 diphtheria.

The age distribution of these children was:

Under 5 years..........................=over ½ of the total
5 to 10 years..........................=over 1/5 of the total
10 to 15 years..........................=over 1/13 of the total
15 to 20 years..........................=about 1/15 of the total
Adults ....=about 1/15 of the total

The approximate distribution of these age groups in Minnesota (census of 1900) was:

Under 5 years..........................=13 % or about 1/8
5 to 9 years..........................=12½ % or 1/8
10 to 14 years..........................=11 % or about 1/9
15 to 19 years..........................= 9.75% or about 1/10
Adults ....=54 % or over 1/2

Hence the group of 257 patients above mentioned is one containing a great excess of children under 5; and a considerable excess of children under 10, as compared with a normal population, while the remaining groups of children are correspondingly short, adults being especially and enormously lacking.

Even with this discrepancy from normal—a discrepancy emphasizing the very young children (i. e., those hardly yet subject to measles or whooping cough) and eliminating largely the older ages, in which the chance to acquire these diseases was greater, the proportion of those who had suffered from these diseases must be less than in a group of children whose age distribution is normal.

Accepting, however, the figures given, it would seem that the children of Minnesota would show (were the histories of their attacks of these diseases fully recorded) that **at least** ¼ had had measles and about ¼ whooping cough. Hence in the total population of Minnesota (2,000,000) showing about 920,000 children, not less than 230,000 have had measles, 230,000 whooping cough. (In many cases the same individual has had both diseases.)

Since no child in this group is over 19, every child must have suffered within the last 19 years. Hence, admitting an even distribution of cases, about 12,000 cases of each disease must have occurred each year.

This is evidently a **low** estimate.

11. WORK OF EPIDEMIOLOGIST AND EPIDEMIOLOGICAL DIVISION SINCE AUGUST, 1903—ORGANIZATION OF EPIDEMIOLOGICAL DIVISION.

Office Work—Reports of communicable diseases received by the secretary and executive officer as registrar of vital statistics are forwarded to this division, to supply information, so far as possible from this source concerning the occurrence of these diseases in the state. Were reporting complete and prompt, such reports would accomplish this end. Under existing negligence of reporting and delay when reporting is done at all, these records are of little immediate use for keeping the division posted on what is occurring at any given date, but in retrospect, they furnish a more or less reliable account of what has occurred. Other and valuable sources of information are those from the specimens sent in for laboratory examination. These are daily obtained from the laboratory in diphtheria, tuberculosis and typhoid fever, occasionally in others. A news clipping bureau also sends newspaper notices of cases, outbreaks, etc., which are investigated by correspondence to learn the facts.

These returns are classified, transferred to index cards and indexed by county, township, city and village.

Each disease has a different colored card. Hence at a glance over the card index drawer may be seen the general condition of each locality. The cases are also classified for each locality on daily sheets by age and sex, a system which keeps all records strictly up to date (so far as the shortcomings of the reporters permit), and thus a tabulated report is ready at any moment for showing the complete returns for each locality. From these annual, quarterly, even weekly or daily returns may be made without effort.

Were the original returns complete and prompt, the spot-map method for showing daily the condition of the state might be employed. This map would show about 10,000 to 12,000 spots and would require on the average the adding or changing of about 100 spots every day, but until the information on which such changes should be based reaches somewhere near to the facts, the time and energy consumed would be wasted.

The intention has been that the notification of a case would result in sending from this office literature regarding the disease concerned, the precautions to be taken, etc., to the affected family; but here again the delay in reporting is such that many cases are recovered or even released from quarantine by the date such literature could reach them. The supervision of the proper release of quarantine cases, and the filing of the release cards, showing the termination of cases, is also within the scope of this division.

In practice, notification by letter or telephone from affected communities is often the first information concerning outbreaks which reach the division. Advice is then given or investigation is made of the outbreak as may be needed. In very many cases which ought to be investigated it is a physical impossibility to do so, from lack of men and time. (It will be remembered that until Jan. 1, 1911, but one field epidemiologist, the director, was attached to the division.) Telephone diagnosis or advice, notoriously weak in the practice of medicine, is equally so in epidemiological work, yet the director has been forced to "settle" thus as many as six different typhoid outbreaks in one morning. Diagnosis or advice by letter is even less satisfactory. None of such work is listed in the reports of investigation.

These reasons have driven the division to the necessity of selecting for investigation, often necessarily on insufficient evidence, those points demanding it in which the need seemed most imminent or the danger of still more serious development most threatening. The situation has been analogous to that of a fire chief in a large city, having a wholly inadequate staff and equipment, and trying to decide amongst many fire alarms turned in at once, to which he can send or go, with the best results and the least harm from neglect of the others.

It will be seen that a skeleton mechanism for the proper conduct of the office work of the division exists, ready to operate in a highly efficient manner if the proper returns could be had, but now operating on partial, delayed and inadequate data. The field work of the division needs only properly trained and conscientious men to cover the enormous burden of field work now resting on the shoulders of two men.

PUBLICATIONS FROM THE DIVISION.

Teaching Bacteriology to Mothers, H. W. Hill (Journal Home Economics, December, 1910).

Poliomyelitis (1)—The Epidemiology of Anterior Poliomyelitis. Journal of Minnesota State Medical Association and Northwestern Lancet, Sept. 1, 1909.

Poliomyelitis (2)—The Contagiousness of Anterior Poliomyelitis. Journal of the Minnesota State Medical Association and Northwestern Lancet, March 15, 1910.

Poliomyelitis (3)—Epidemiologic Study of Poliomyelitis in Minnesota. Transactions of Section on Preventive Medicine and Public Health of the American Medical Association, 1910.

Epidemiology of Typhoid Fever.

Epidemiology of Diphtheria, Scarlet Fever and Measles. (Journal of the A. P. H. A., Aug. 25, 1910.)

What Is Public Health Work? (Minnesota Alumni Weekly, Jan. 9, 1911.)

Sources and Routes of Infection. (Minnesota Alumni Weekly, February, 1911.)

Non-Relation of Natural Ice to Typhoid Fever and Dysentery. (Natural Ice Association of America.)

A "Score System" for Determining the Real Relative Importance of the Different Infectious Diseases. (Journal of the American Public Health Association, January, 1911.)

Artificial Milk; a Substitute for Ordinary Milk as a Laboratory Medium. (American Journal of Public Hygiene, August, 1910.)

The Uses of Morbidity Reports. (Journal of the Minnesota State Medical Association and Northwestern Lancet, Aug. 15, 1910.)

12. ORGANIZATION OF FIELD WORK.

The general methods employed in all these investigations consisted in those already described in the introduction. These may be summarized as:

First—Securing as complete as possible a list of the cases concerned.

Second—Visiting each of these, securing the epidemiological data, tabulating and examining the same.

Third—Deducing from the data the apparent source, examining this indicated source to determine if it adequately accounts for the outbreak.

Fourth—Taking immediate emergency measures to prevent further spread.

A few of the most striking and interesting results obtained in field practice follow:

WORK OF EPIDEMIOLOGICAL DIVISION BY DATES.

Date.	Place.	Investigation.
July 28, 1909	Winona	Polio.
to	and	
Aug. 1, 1909	Lake City	Polio.
Aug. 3, 1909	St. Paul	Polio.
Aug. 18, 1909	Finlayson	Polio.
Aug. 20, 1909	Glencoe	T. B. exhibit.
Aug. 23, 1909	Duluth	Scarlet fever.
Aug. 30, 1909	Northfield	Polio.
Sept. 2 to 4, 1909	Buhl	Typhoid.
Sept. 13, 1909	Ortonville	Polio.
Sept. 13. 1909	Renville	Polio.
Sept. 15, 1909	Litchfield	Polio.
	Grove City	Polio.
	Dassel	Polio.
	Montrose	Polio.
to	Atwater	Polio.
	Darwin	Polio.
	Knapp	Polio.
	Howard Lake	Polio.
Sept. 19 1909	Spicer	Polio.
Sept. 23, 1909	Minneapolis	Polio.
Sept. 28, 1909	Hastings	Polio.
	Lake City	Polio.
	Red Wing	Typhoid, Steamer "J. S."
to	Lake City	Polio.
	Wabasha	Polio.
Sept. 30, 1909	Kellogg	Polio.
Oct. 1, 1909	Proctor	Polio.
Oct. 1, 1909	Duluth	Polio.
Oct. 6, 1909	Cannon Falls	Lecture on polio.
	Knife River	Typhoid.
to	Kinmount	Typhoid.
	Two Harbors	Typhoid.
Oct. 9, 1909	Virginia	Typhoid.
Oct. 27, 1909	Albert Lea	Diphtheria.
Nov. 2, 1909	Little Falls	Typhoid.
Nov. 4, 1909	Red Wing	Scarlet fever.
Nov. 9, 1909	Luverne	Smallpox.
Nov. 11, 1909	St. Peter	Typhoid, etc.

Date.	Place.	Investigation.
Nov. 19, 1909	Albertville	Smallpox.
Nov. 26, 1909	Melrose	Typhoid.
Dec. 1, 1909	South St. Paul	Scarlet fever.
Dec. 3, 1909	White Bear	Polio.
Dec. 4, 1909	Rosetown Twp., Ramsey Co.	Diphtheria.
Dec. 13, 1909	Anoka	Typhoid.
Dec. 28, 1909	Mankato	Milk samples.
Dec. 31, 1909	Waconia	Diphtheria.
Jan. 3, 1910	Goodhue	Trichiniasis.
Jan. 7, 1910	South St. Paul	Subpoena: Prosecution for non-report.
Jan. 12, 1910	St. Paul	Polio (?) in horses.
Jan. 13, 1910	Blue Earth	Polio.
Jan. 14, 1910	Pipestone	T. B. exhibit.
Jan. 15, 1910	Two Harbors	Typhoid.
Jan. 19, 1910	Gilbert	Typhoid.
Jan. 19, 1910	Sparta	Typhoid.
Jan. 19, 1910	Pettit, etc	Typhoid.
Jan. 19, 1910	Virginia	Typhoid.
Jan. 22, 1910	Brainerd	Typhoid.
Jan. 24, 1910	Owatonna	Pellagra vs. sphilis (diag.)
Jan. 26, 1910	St. Thomas College, St. Paul	Scarlet fever.
Jan. 27, 1910	Elbow Lake	Diphtheria, etc.
Feb. 10, 1910	Buffalo	Typhoid.
Feb. 11, 1910	Detroit	Trachoma.
Feb. 11, 1910	Lake Park	Polio.
Feb. 14, 1910	Minneapolis	Oyster packing.
Feb. 17, 1910	Winthrop	T. B. lecture.
Feb. 23, 1910	Red Wing	Scarlet fever.
Feb. 25, 1910	Brainerd	Lecture, typhoid.
Feb. 28, 1910	Minneapolis	Typhoid.
Mar. 8, 1910	State Agricultural College	Typhoid, smallpox and measles.
Mar. 11, 1910	Minneapolis	Conference on typhoid in Minneapolis.
Mar. 21, 1910	Gilbert	Proposed water supply.
Mar. 28, 1910	Perham	Smallpox.
Mar. 31, 1910	Univ. Hosp. (Minneapolis)	Smallpox.
April 1, 1910	Delano	T. B. exhibit.
April 2, 1910	Delano	Complaint of bad drainage.
April 5, 1910	St. Paul	Exec. committee meeting.
April 11, 1910	Minneapolis	City Health Dept. typhoid records.
April 11, 1910	Litchfield	T. B. exhibit.
April 12, 1910	St. Paul	Quar. board meeting.
April 13, 1910	Atwater	T. B. exhibit.
April 14, 1910	Willmar	T. B. exhibit.
April 21, 1910	Benson	T. B. exhibit.
May 10, 1910	E. Grand Forks, Grand Fks.	T. B. exhibit.
May 16, 1910	St. Paul	Capitol.
May 17, 1910	St. Paul	Board meeting.
May 18, 1910	Barnesville	T. B. exhibit.
May 18, 1910	Fergus Falls	T. B. exhibit.
May 21, 1910	Wayzata	Scarlet fever vs. German measles, diag.
May 26, 1910	Hibbing	Dysentery.
June 1, 1910	Lake City	Polio(?) in horses.
June 1, 1910	Kellogg	Polio(?) in horses.
June 3, 1910	Renville	Polio(?).
June 21, 1910	White Bear	Smallpox.
June 27, 1910	Hopkins	Factory inspection.
July 6, 1910	St. Paul	Capitol.
July 6, 1910	Old Capitol, St. Paul	T. B. conference.
July 8, 1910	Wabasha	Diphtheria.
July 12, 1910	St. Paul	Quar. board meeting.
July 12, 1910	Lewiston	Diphtheria.
July 28, 1910	Minneapolis	Polio.
Aug. 2, 1910	St. Paul	Capitol. Conf. Board of Control.
Aug. 5, 1910	Marble	Dysentery and typhoid.
Aug. 5, 1910	Taconite	Dysentery and typhoid.
Aug. 5, 1910	Bovey	Dysentery and typhoid.
Aug. 5, 1910	Coleraine	Dysentery and typhoid.
Aug. 5, 1910	Chisholm	Dysentery and typhoid.
Aug. 5, 1910	Hibbing	Dysentery and typhoid.
Aug. 11, 1910	St. Peter Asylum	Typhoid.
Aug. 11, 1910	Mankato	Typhoid.
Aug. 17, 1910	Hibbing	Typhoid.
Aug. 17, 1910	Virginia	Typhoid.

Date.	Place.	Investigation.
Aug. 17, 1910	Nashwauk	Typhoid.
Aug. 23, 1910	Lake Sarah	Typhoid.
Aug. 25, 1910	Morris	Dysentery.
Aug. 29, 1910	Tracy	Scarlet fever and polio.
Sept. 3, 1910	Bloomington	Polio (?) pig.
Sept. 16, 1910	St. Cloud	T. B. exhibit.
Sept. 16, 1910	Alexandria	T. B. exhibit.
Sept. 16, 1910	Fergus Falls Asylum	Typhoid.
Sept. 23, 1910	Crookston	T. B. exhibit.
to Sept. 28, 1910	Trout Lake	Typhoid.
	Coleraine	Typhoid.
	Duluth	Typhoid and dysentery.
	Deerwood	Typhoid.
	Thief River Falls	T. B. exhibit.
Oct. 3, 1910	Bemidji	T. B. exhibit and typhoid.
Oct. 5, 1910	Minneapolis	State Sanitary Conference.
Oct. 6, 1910	Faribault	Typhoid.
to Oct. 11, 1910	Park Rapids	T. B. exhibit.
	Wadena	T. B. exhibit and dairy inspection.
	Anoka Asylum	Typhoid
	Ham Lake Twp., Anoka Co	Typhoid (wire grass camp).
Oct. 11, 1910	International Falls and Beaudette, forest fires	Typhoid.
Oct. 20, 1910	St. Paul	Capitol.
Oct. 20, 1910	Hamline University	Typhoid.
Oct. 25, 1910	St. Paul	Quar. board meeting.
Oct. 26, 1910	Lamberton Twp., Redwood Co.	Typhoid.
Oct. 31, 1910	Elk River	T. B. lecture.
Oct. 31, 1910	Becker Twp., Sherburne Co	Typhoid.
Nov. 2, 1910	Stillwater	Suspected leprosy.
Nov. 3, 1910	Anoka	T. B. lecture.
Nov. 9, 1910	St. Paul	Capitol, business.
Nov. 29, 1910	St. Paul	Exec. committee meeting.
Dec. 5, 1910	Winona	Lecture, typhoid.
Dec. 27, 1910	Dayton Twp., Hennepin Co.	Typhoid.
**Oct. 31, 1910	Wrenshall	Diphtheria.
*Nov. 14, 1910	Worthington	Diphtheria.
*Nov. 21, 1910	Two Harbors	Diphtheria.
*Nov. 23, 1910	Two Harbors	Typhoid.
*Dec. 4, 1910	Owatonna	Typhoid.
*Dec. 12, 1910	Duluth	Diphtheria.
*Dec. 18, 1910	Roseau County	Typhoid.
*Dec. 20, 1910	Thief River Falls	Typhoid in threshing crews.

*Trips made by Dr. Chesley.
**Trips made by Dr. McEwan.
Total visits to places, 152.

WORK OF EPIDEMIOLOGICAL DIVISION BY PLACES.

Place.	Date.	Investigation.
Albert Lea	Oct. 27, 1909	Diphtheria.
Albertville	Nov. 19, 1909	Smallpox.
Alexandria	Sept. 16, 1910	T. B. exhibit.
Anoka	Dec. 13, 1909	Typhoid.
Anoka	Oct. 6, 1910	Typhoid.
Anoka	Nov. 3, 1910	Typhoid.
Anoka	Dec. 12, 1910	T. B. exhibit.
Atwater	Sept. 19, 1909	Polio.
Atwater	April 13, 1910	T. B. exhibit.
Becker Twp., Sherburne Co.	Oct. 31, 1910	Typhoid.
Barnesville	May 18, 1910	T. B. exhibit.
Beaudette	Oct. 11, 1910	Typhoid.
Bemidji	Oct. 3, 1910	T. B. exhibit and typhoid.
Benson	April 21, 1910	T. B. exhibit.
Blue Earth	Jan. 13, 1910	Polio.
Brainerd	Jan. 22, 1910	Typhoid.
Brainerd	Feb. 25, 1910	Lecture, typhoid.
Bovey	Aug. 5, 1910	Dysentery and typhoid.
Bloomington	Sept. 3, 1910	Polio (?) pig.
Buffalo	Feb. 10, 1910	Typhoid.
Buhl	Sept. 2, 1909	Typhoid.
Cannon Falls	Oct. 6, 1909	Lecture on polio.
Chisholm	Aug. 5, 1910	Typhoid and dysentery.
Coleraine	Aug. 5, 1910	Typhoid.
Coleraine	Sept. 23, 1910	Typhoid.

Place.	Date.	Investigation.
Crookston	Sept. 23, 1910	T. B. exhibit.
Delano	April 1, 1910	T. B. exhibit.
Delano	April 2, 1910	Complaint of bad drainage.
Detroit	Feb. 11, 1910	Trachoma.
Deerwood	Sept. 23, 1910	Typhoid.
Dayton Twp., Hennepin Co.	Dec. 27, 1910	Typhoid.
Dassel	Sept. 19, 1909	Polio.
Darwin	Sept. 19, 1909	Polio.
Duluth	Aug. 23, 1909	Scarlet fever.
Duluth	Oct. 1, 1909	Polio.
Duluth	Sept. 23, 1910	Typhoid and dysentery.
Duluth	Dec. 12, 1910	Diphtheria.
Elbow Lake	Jan. 27, 1910	Diphtheria.
E. Grand Forks	May 10, 1910	T. B. exhibit.
Elk River	Oct. 31, 1910	T. B. lecture.
Finlayson	Aug. 18, 1909	Polio.
Fergus Falls	May 18, 1910	T. B. exhibit.
Fergus Falls	Sept. 16, 1910	Typhoid.
Faribault	Oct. 6, 1910	Typhoid.
Glencoe	Aug. 20, 1909	T. B. exhibit.
Grove City	Sept. 15, 1909	Polio.
Goodhue	Jan. 3, 1910	Trichiniasis.
Gilbert	Jan. 19, 1910	Typhoid.
Gilbert	Mar. 21, 1910	Proposed water supply
Grand Forks	May 10, 1910	T. B. exhibit.
Howard Lake	Sept. 19, 1909	Polio.
Hastings	Sept. 28, 1909	Polio.
Hibbing	May 26, 1910	Dysentery.
Hibbing	Aug. 17, 1910	Typhoid.
Hibbing	Aug. 5, 1910	Typhoid and dysentery.
Hopkins	June 27, 1910	Factory inspection.
Hamline University	Oct. 20, 1910	Typhoid.
International Falls	Oct. 11, 1910	Typhoid.
Knapp	Sept. 19, 1909	Polio.
Kellogg	Sept. 28, 1909	Polio.
Knife River	Oct. 6, 1909	Typhoid.
Kinmount	Oct. 6, 1909	Typhoid.
Kellogg	June 1, 1910	Polio (?) in horses.
Lake City	Aug. 1, 1909	Polio (?) in horses.
Lake City	Sept. 28, 1909	Polio.
Lake City	June 1, 1910	Polio (?) in horses.
Litchfield	Sept. 15, 1909	Polio.
Little Falls	Nov. 2, 1909	Typhoid.
Lake Park	Feb. 11, 1910	Polio.
Litchfield	April 11, 1910	T. B. exhibit.
Lewiston	July 12, 1910	Diphtheria.
Lake Sarah	Aug. 25, 1910	Typhoid.
Lamberton Twp., Redwood Co.	Oct. 26, 1910	Typhoid.
Luverne	Nov. 9, 1909	Smallpox.
Montrose	Sept. 19, 1909	Polio.
Melrose	Nov. 26, 1909	Typhoid.
Mankato	Dec. 28, 1909	Milk samples.
Mankato	Aug. 11, 1910	Typhoid.
Minneapolis	Sept. 23, 1909	Polio.
Minneapolis	Feb. 14, 1910	Oyster packing.
Minneapolis	Feb. 28, 1910	Typhoid.
Minneapolis	Mar. 11, 1910	Conference on typhoid in Minneapolis.
Minneapolis	April 11, 1910	City Health Dept. typhoid records.
Minneapolis	July 28, 1910	Polio.
Minneapolis	Oct. 5, 1910	State Sanitary Conference
Marble	Aug. 5, 1910	Dysentery and typhoid.
Morris	Aug. 25, 1910	Dysentery.
Northfield	Aug. 30, 1909	Polio.
Nashwauk	Aug. 17, 1910	Typhoid.
Ortonville	Sept. 13, 1909	Polio.
Owatonna	Jan. 24, 1910	Pellagra vs. syphilis (diag.)
Owatonna	Dec. 4, 1910	Typhoid.
Pettit	Jan. 19, 1910	Typhoid.
Proctor	Oct. 1, 1909	Polio.
Pipestone	Jan. 14, 1910	T. B. exhibit.
Perham	Mar. 28, 1910	Smallpox.
Park Rapids	Oct. 6, 1910	T. B. exhibit.
Renville	Sept. 13, 1909	Polio.
Red Wing	Sept. 28, 1909	Typhoid. Steamer "J. S."
Red Wing	Nov. 4, 1909	Scarlet fever.
Rose Twp., Ramsey Co.	Dec. 4, 1909	Diphtheria.
Red Wing	Feb. 23, 1910	Scarlet fever.
Renville	June 3, 1910	Polio(?).
Roseau County	Dec. 18, 1910	Typhoid.
St. Paul	Aug. 3, 1909	Polio.
Spicer	Sept. 19, 1909	Polio.

Place.	Date.	Investigation.
St. Cloud	Sept. 16, 1910	T. B. exhibit.
St. Paul	Aug. 3, 1909	Typhoid.
St. Paul	Jan. 12, 1910	Polio (?) in horses.
St. Paul	April 5, 1910	Exec. committee meeting.
St. Paul	April 12, 1910	Board meeting.
St. Paul	May 16, 1910	Capitol.
St. Paul	May 17, 1910	Board meeting.
St. Paul	July 6, 1910	Capitol.
St. Paul	July 6, 1910	Old capitol, T. B. conference.
St. Paul	July 12, 1910	Board meeting.
St. Paul	Aug. 2, 1910	Capitol, conference Board of Control.
St. Paul	Oct. 20, 1910	Capitol.
St. Paul	Oct. 25, 1910	Board meeting.
St. Paul	Nov. 9, 1910	Capitol.
St. Paul	Nov. 29, 1910	Exec. committee meeting.
St. Peter	Nov. 11, 1909	Typhoid, etc.
St. Peter	Aug. 11, 1910	Typhoid.
St. Thomas College	Jan. 26, 1910	Scarlet fever.
South St. Paul	Dec. 1, 1909	Scarlet fever.
South St. Paul	Jan. 7, 1910	Subpoena: Prosecution for non-report.
Sparta	Jan. 19, 1910	Typhoid.
Spicer	Sept. 19, 1909	Polio.
State Agricultural College	Mar. 8, 1910	Typhoid, smallpox, measles.
Stillwater	Nov. 2, 1910	Suspected leprosy.
Taconite	Aug. 5, 1910	Typhoid and dysentery.
Thief River Falls	Sept. 23, 1910	T. B. exhibit.
Thief River Falls	Dec. 20, 1910	Typhoid in threshing crews.
Tracy	Aug. 29, 1910	Scarlet fever and polio.
Trout Lake	Sept. 23, 1910	Typhoid.
Two Harbors	Oct. 6, 1909	Typhoid.
Two Harbors	Jan. 15, 1910	Typhoid.
Two Harbors	Nov. 21, 1910	Diphtheria.
Two Harbors	Nov. 23, 1910	Typhoid.
University Hospital, Mpls	Mar. 31, 1910	Smallpox.
Virginia	Oct. 6, 1909	Typhoid.
Virginia	Jan. 19, 1910	Typhoid.
Virginia	Aug. 17, 1910	Typhoid.
Wabasha	Sept. 28, 1909	Polio.
Wabasha	July 8, 1910	Diphtheria.
Waconia	Dec. 31, 1909	Diphtheria.
Wadena	Oct. 6, 1910	T. B. exhibit and dairy inspection.
Wayzata	May 21, 1910	Diagnosis: Scarlet fever vs. German measles.
White Bear	Dec. 9, 1909	Polio.
White Bear	June 21, 1910	Smallpox.
Willmar	April 14, 1910	T. B. lecture.
Winona	July 28, 1909	Polio.
Winona	Dec. 5, 1910	Lecture, typhoid.
Winthrop	Feb. 17, 1910	T. B. lecture.
Worthington	Nov. 14, 1910	Diphtheria.
Wrenshall	Oct. 31, 1910	Diphtheria.

WORK OF EPIDEMIOLOGICAL DIVISION BY DISEASES.

Investigation.	Date.	Place.
Diphtheria	Oct. 27, 1909	Albert Lea.
Diphtheria	July 12, 1910	Lewiston.
Diphtheria	Nov. 21, 1910	Two Harbors.
Diphtheria	Dec. 31, 1909	Waconia.
Diphtheria	July 8, 1910	Wabasha.
Diphtheria	Oct. 31, 1910	Wrenshall.
Diphtheria	Nov. 14, 1910	Worthington.
Diphtheria	Dec. 4, 1909	Rose Twp., Ramsey Co.
Diphtheria	Dec. 12, 1910	Duluth.
Diphtheria	Jan. 27, 1910	Elbow Lake.
Dysentery and typhoid	Aug. 5, 1910	Bovey.
Dysentery and typhoid	Aug. 5, 1910	Chisholm.
Dysentery and typhoid	Sept. 23, 1910	Duluth.
Dysentery and typhoid	Aug. 5, 1910	Marble.
Dysentery and typhoid	Aug. 5, 1910	Taconite.
Dysentery and typhoid	Aug. 5, 1910	Hibbing.
Dysentery and typhoid	Aug. 5, 1910	Coleraine.

Investigation.	Date.	Place.
Dysentery and typhoid	May 26, 1910	Hibbing.
Leprosy (suspected)	Nov. 2, 1910	Stillwater.
Dysentery	Aug. 25, 1910	Morris.
Measles	Mar. 8, 1910	State Agricultural College, St. Paul.
Polio	Sept. 19, 1909	Atwater.
Polio	Jan. 13, 1910	Blue Earth.
Polio (?) pig	Sept. 3, 1910	Bloomington.
Polio lecture	Oct. 6, 1909	Cannon Falls.
Polio	Sept. 19, 1909	Dassel.
Polio	Sept. 19, 1909	Darwin.
Polio	Oct. 1, 1909	Duluth.
Polio	Aug. 18, 1909	Finlayson.
Polio	Sept. 15, 1909	Grove City.
Polio	Sept. 19, 1909	Howard Lake.
Polio	Sept. 28, 1909	Hastings.
Polio	Sept. 19, 1909	Knapp.
Polio	Sept. 28, 1909	Kellogg.
Polio (?) in horses	June 1, 1910	Kellogg.
Polio	Aug. 1, 1909	Lake City.
Polio	Sept. 15, 1909	Litchfield.
Polio	Sept. 28, 1909	Lake City.
Polio	Feb. 11, 1910	Lake Park.
Polio (?) in horses	June 1, 1910	Lake City.
Polio	Sept. 19, 1909	Montrose.
Polio	Sept. 23, 1909	Minneapolis.
Polio	July 28, 1910	Minneapolis.
Polio	Aug. 30, 1909	Northfield.
Polio	Sept. 13, 1909	Ortonville.
Polio	Oct. 1, 1909	Proctor.
Polio	Sept. 13, 1909	Renville.
Polio	June 3, 1910	Renville.
Polio	Aug. 3, 1909	St. Paul.
Polio	Sept. 19, 1909	Spicer.
Polio (?) in horses	Jan. 12, 1910	St. Paul.
Polio	July 28, 1909	Winona.
Polio	Dec. 3, 1909	White Bear.
Polio	Sept. 28, 1909	Wabasha.
Polio	Aug. 29, 1910	Tracy.
Scarlet fever	Aug. 23, 1909	Duluth.
Scarlet fever	Nov. 4, 1909	Red Wing.
Scarlet fever	Feb. 23, 1910	Red Wing.
Scarlet fever	Dec. 1, 1909	South St. Paul.
Scarlet fever	Jan. 26, 1910	St. Thomas College, St. Paul.
Scarlet fever	Aug. 29, 1910	Tracy.
Scarlet fever vs. German measles (diag.)	May 21, 1910	Wayzata.
Smallpox	Nov. 19, 1909	Albertville.
Smallpox	Mar. 8, 1910	State Agricultural College, St. Paul.
Smallpox	Mar. 28, 1910	Perham.
Smallpox	Mar. 31, 1910	University hospital, Minneapolis.
Smallpox	June 21, 1910	White Bear.
Smallpox	Nov. 9, 1909	Luverne.
Trichiniasis	Jan. 3, 1910	Goodhue
Trachoma	Feb. 11, 1910	Detroit.
T. B. exhibit	Sept. 16, 1910	Alexandria.
T. B. exhibit	Nov. 3, 1910	Anoka.
T. B. exhibit	April 13, 1910	Atwater.
T. B. exhibit	May 18, 1910	Barnesville.
T. B. exhibit	Oct. 3, 1910	Bemidji.
T. B. exhibit	April 21, 1910	Benson.
T. B. exhibit	Sept. 23, 1910	Crookston.
T. B. exhibit	April 1, 1910	Delano.
T. B. exhibit	May 10, 1910	E. Grand Forks.
T. B. exhibit	Oct. 31, 1910	Elk River.
T. B. exhibit	May 18, 1910	Fergus Falls.
T. B. exhibit	Aug. 20, 1909	Glencoe.
T. B. exhibit	May 10, 1910	Grand Forks.
T. B. exhibit	April 11, 1910	Litchfield.
T. B. exhibit	Jan. 14, 1910	Pipestone.
T. B. exhibit	Oct. 6, 1910	Park Rapids.
T. B. conference	July 6, 1910	St. Paul.
T. B. exhibit	Sept. 16, 1910	St. Cloud.
T. B. exhibit	Sept. 23, 1910	Thief River Falls.
T. B. exhibit	Feb. 17, 1910	Winthrop.
T. B. exhibit	April 14, 1910	Willmar.
T. B. exhibit	Oct. 6, 1910	Wadena.
Typhoid	Dec. 13, 1909	Anoka.
Typhoid	Oct. 31, 1910	Bemidji.
Typhoid	Oct. 6, 1910	Anoka.
Typhoid	Oct. 31, 1910	Becker Township.
Typhoid	Oct. 11, 1910	Beaudette.
Typhoid	Jan. 22, 1910	Brainerd.
Typhoid	Feb. 25, 1910	Brainerd.
Typhoid	Feb. 10, 1910	Buffalo.
Typhoid	Sept. 2, 1909	Buhl.
Typhoid	Sept. 23, 1910	Coleraine.

Investigation.	Date.	Place.
Typhoid	Sept. 23, 1910	Deerwood.
Typhoid	Dec. 27, 1910	Dayton Twp., Hennepin Co.
Typhoid	Sept. 16, 1910	Fergus Falls.
Typhoid	Oct. 6, 1910	Faribault.
Typhoid	Jan. 19, 1910	Gilbert.
Typhoid	Aug. 17, 1910	Hibbing.
Typhoid	Oct. 20, 1910	Hamline University, St. Paul.
Typhoid	Oct. 11, 1910	International Falls.
Typhoid	Oct. 6, 1909	Knife River.
Typhoid	Oct. 6, 1909	Kinmount.
Typhoid	Nov. 2, 1909	Little Falls.
Typhoid	Aug. 25, 1910	Lake Sarah.
Typhoid	Oct. 26, 1910	Lamberton Twp., Redwood Co.
Typhoid	Nov. 26, 1910	Melrose.
Typhoid	Feb. 28, 1910	Minneapolis.
Typhoid, conference on	Mar. 11, 1910	Minneapolis.
Typhoid	April 11, 1910	Minneapolis.
Typhoid	Aug. 11, 1910	Mankato.
Typhoid	Aug. 17, 1910	Nashwauk.
Typhoid	Dec. 4, 1910	Owatonna.
Typhoid	Jan. 19, 1910	Pettit.
Typhoid	Sept. 28, 1909	Red Wing, Steamer "J. S."
Typhoid	Dec. 18, 1910	Roseau County.
Typhoid	Nov. 11, 1909	St. Peter.
Typhoid	Mar. 8, 1910	State Agricultural College, St. Paul.
Typhoid	Jan. 19, 1910	Sparta.
Typhoid	Aug. 11, 1910	St. Peter.
Typhoid	Oct. 6, 1909	Two Harbors.
Typhoid	Jan. 15, 1910	Two Harbors.
Typhoid	Sept. 23, 1910	Trout Lake.
Typhoid	Nov. 23, 1910	Two Harbors.
Typhoid	Dec. 20, 1910	Thief River Falls.
Typhoid	Oct. 6, 1909	Virginia.
Typhoid	Jan. 19, 1910	Virginia.
Typhoid	Aug. 17, 1910	Virginia.
Typhoid lecture	Dec. 5, 1910	Winona.

MISCELLANEOUS.

Investigation.	Date.	Place.
State Sanitary Conference	Oct. 5, 1910	Unitarian Church, Mpls.
Conf. Board of Control	Aug. 2, 1910	St. Paul.
Board meeting.	July 12, 1910	St. Paul.
Capitol	July 6, 1910	St. Paul.
Board meeting	May 17, 1910	St. Paul.
Capitol	May 16, 1910	St. Paul.
Board meeting.	April 12, 1910	St. Paul.
Exec. committee meeting	April 5, 1910	St. Paul.
Subpoena; prosecution for non-report	Jan. 7, 1910	South St. Paul.
Milk samples	Dec. 28, 1909	Mankato.
Oyster packing	Feb. 14, 1910	Minneapolis.
Proposed water supply	Mar. 21, 1910	Gilbert.
Exec. committee meeting	Nov. 29, 1910	St. Paul.
Factory inspection	June 27, 1910	Hopkins.
Complaint of bad drainage	April 2, 1910	Delano.
Board meeting.	Oct. 25, 1910	St. Paul.
Capitol	Oct. 20, 1910	St. Paul.
Capitol	Nov. 9, 1910	St. Paul.
Dairy inspection	Oct. 6, 1910	Willmar.

POLIOMYELITIS.

The poliomyelitis of 1909 was studied with great care by this division and the results were published in full in the transactions of the American Medical association ("Epidemiologic Study of Anterior Poliomyelitis in Minnesota").

Previous to this, publications had been made outlining the work done before the completion of the year, "Epidemiology of Poliomyelitis" in the Northwestern Lancet, Sept. 1, 1909, and "Contagiousness of Poliomyelitis" N. W. Lancet, March 15, 1910.

In 1910 the pressure of other work prevented the one field man engaged by the Board for such forms of investigation from following up poliomyelitis in detail. The main points of interest had been worked upon during 1909 and brought as near settlement as seemed possible. Hence in 1910 no continuous piece of work was done on this subject.

Requests for visits to various points to make diagnoses were met by the statement that this division was unable to diagnose poliomyelitis until the typical paralysis developed, and that when the typical paralysis had developed the disease could be diagnosed by one who had no expert experience. It was very unfortunate that our short-handed condition made it impossible to follow up the outbreak of 1910, but we could find no reason to do spasmodic or irregular superficial work on the disease, and no time or opportunity to do any other kind. Hence poliomyelitis in 1910 was not investigated except that records were kept of all cases reported, and the physician was asked to fill out complete returns similar to those made in 1909 for each case.

Efforts were made to trace cases of poliomyelitis in the lower animals, particularly in a pig, the results of which were as follows:

A Condition Simulating Poliomyelitis in a Pig.

A female pig, about sixteen months old. Chiefly Poland-China by breed. Had a litter of pigs when about twelve months old, all still in excellent condition. They were taken from her about six weeks later. Next day she seemed a little sick and staggering. Two or three days later she was paralyzed in all four feet, with constipation, and squealed when touched. Three or four weeks later she began to improve. Two weeks later or six weeks from the first attack in the pig, a little girl in the family of the owner developed typical poliomyelitis with paralysis.

The pig was taken to the Minnesota State Board of Health laboratories and kept under observation for a week.

Dr. A. S. Hamilton, tested her muscles with faradic and galvanic currents, and concluded that certain groups of muscles, particularly the anterior tibial on the right side, gave typical reactions of poliomyelitis.

On autopsy, made by Dr. W. L. Beebe, veterinarian and bacteriologist of the State Live Stock Sanitary Board, and Dr. H. E. Robertson, associate professor of pathology, university of Minnesota, no cause for the atrophy of these or other groups of muscles was discovered. Sections of the cord failed to reveal any lesions such as are supposed to be typical of poliomyelitis at this stage, or in fact lesions of any kind.

This case would seem to be, clinically and by autopsy (short of examination of the cord), typical of a disease indistinguishable from poliomyelitis.

Examination of the cord to date failed to find any proof that poliomyelitis had existed.

In a few instances trips for diagnosis were made where the circumstances were peculiar and expert advice apparently really necessary.

13. Selected accounts of individual investigations indicating points of special interest.

POLIOMYELITIS.

Dust as an Apparent Factor in Spread.

A prolonged investigation already published elsewhere was made involving visits to 33 places in the state, together with side trips from many of these. Every case seen was investigated clinically and epidemiologically.

At Winona, the investigation showed practically all the existing cases were on or near unwatered and very dusty streets. The city was panic stricken and my advice transmitted and reinforced to the city council by Dr. Donald Pritchard, H. O., of Winona, together with a map on which the cases were plotted, showing their relation to the watered and unwatered streets, resulted in securing the watering of these streets as well as the watering of sidewalks, etc. The watering began Aug. 5 and the last case developed Aug. 12. When it is remembered that the incubation period of this disease is supposed to be about seven days it will be understood that no case received infection **after the watering began.** Since the district surrounding Winona and the state at large continued to suffer from the disease for months after this date (the oütbreak reaching its height a month later) it seems not unreasonable to suppose that the ending of the Winona outbreak when the watering began was not merely a coincidence, especially since Eau Claire and New Richmond in Wisconsin had previously had similar experiences.

DIPHTHERIA.

Butter-Carriage.

At Lewiston, an outbreak of diphtheria presented several interesting features.

A careful search revealed the fact that the neighborhood had been singularly free of diphtheria and scarlet fever until April. A farmer's son, at school in the Twin Cities, had returned home April 13, with the history that in March he had had an attack thought at first to be measles. He had been removed to a hospital where it was found that he had scarlet fever. Later, at the hospital he contracted diphtheria. After release April 10, he returned to the school, and so home April 13. On April 20, a brother on the farm contracted diphtheria; and a few days later another brother contracted scarlet fever, evidently both diseases coming from infection brought home by the first boy.

During the whole period, the family continued to supply the local creamery with cream, contrary to the regulations of the State Board of Health.

Later on, this family was released from quarantine and the first boy attended church. Within the proper time, another family, attendants at the same church on the same day; showed diphtheria, and the disease gradually spread, by contact at sociables, etc., until a number of neighboring families had one or more cases unrecognized until the throats were examined. In one family a boy, apparently unconscious of being ill, was found with a membrane throat and a temperature of 103° F., several others in the family being similarly affected. Cultures showed diphtheria bacilli but no physician had been called and everything about the farm was going on as usual, trips were being made to town, etc., etc.

Only one even of the quarantined famillities ceased sending cream to the creamery.

Enquiry showed a number of cases in the village itself. Some time was spent in untangling the relations of case to case but at last it became clear that no ordinary common source existed nor could contact with outside families be discovered. One case was a man, a stockbuyer who moved about the country a great deal and might have picked up his infection almost anywhere.

The rest were quite unaccounted for until it was found that every family had used creamery butter about the proper time to account for the subsequent case. Some families were in the habit of using creamery butter. Some denied using it and then by further search of memories remembered ordering one or two pounds for some special reason. In brief it turned out that although but a small percentage of the villagers bought creamery butter at all (on account of its relatively high price) every infected family but one (already mentioned) had used the butter, and at the proper time.

Further enquiry as to other consumers of the butter disclosed that the bulk of it was shipped to Philadelphia and there distributed. As it seemed evident that but a small portion of the butter had been shipped out, the Creamery Director was instructed to receive no more cream from infected families, and the latter were forbidden to deliver cream to him.

The tracing of the butter from Philadelphia was neglected in the press of other duties nearer home.

Laboratory tests showed that diphtheria bacilli would survive in and be recoverable from butter for a period of one month, when kept under the conditions usual to butter.

DUKES DISEASE.

A Rare Outbreak in Minnesota.

At Wayzata, an outbreak which the local physicians could not identify with scarlet fever, measles, or German measles was referred to this division. An investigation left the question as it stood, i. e., in agreement with the local health officer's diagnosis of Dukes disease. It was pointed out that the disease whatever the contending diagnosticians might call it, was contagious and therefore should be quarantined, which was done. This is the first and only recorded instance of this disease encountered by this division. It is still a matter undecided in epidemiological and clinical centers whether there is a "fourth" disease or not. Certainly in this outbreak, frank cases of the three other diseases or of any one of them did not occur, as should have been the case were the disease here encountered a mild or aberrant form as is sometimes held of one or another of them.

TYPHOID FEVER.

Well-Carriage.

So rare has been infection of wells with typhoid fever in Minnesota in the experience of this division, that a well authenticated case is worth quoting.

At Little Falls, about twenty school children were affected, nearly all at one school. The existence of other cases at other schools confused the local authorities until a search of the records showed that these cases had been at the first school and later had been transferred in their incubation periods to the others. Every case was visited as usual and all sources eliminated except the school well. It was found that the school sewer ran close to the well which was shallow and in creviced rock. The epidemiological evidence was perfect and the well was condemned. Analyses were made later and demonstrated infection with human discharges. Still later the sewer was excavated and was then found to consist not of proper iron pipe or even good sewer pipe but merely of unjointed drainage tile. Into this the roots of trees had crept, disrupting and plugging the pipe and forcing the sewage to seek channels of its own, one or more of which unfortunately led to the adjacent well. A previous outbreak of diarrhea, without typhoid however, was thus explained as due to the infection of the well with human discharges free from typhoid bacilli. The infection this time (which broke out in the first month of the fall term) was evidently due to human discharges containing typhoid bacilli, and the infector was found in the case of a pupil who had contracted mild typhoid while on a vacation, returning to school and later becoming definitely ill.

The prompt cessation of the outbreak on the abandonment of its use by order of the superintendent just before the investigation was made confirmed the epidemiological deductions.

TYPHOID FEVER.

Fly-Carriage.

At Buhl an outbreak of typhoid fever illustrated epidemiological methods and results very nicely. Most of the fifteen men concerned in the outbreak drank water of a certain mine. Investigation had shown gross carelessness in the deposits of human discharges in certain drifts tributary to the "sump" from which the water was taken. A very few cases existed which had not used this water, but the water was held responsible and an analysis asked for.

Enquiry showed that men only were affected yet about 200 persons, men and women in one community, used the water without suffering. Further enquiry showed that nearly all the affected cases lived in one boarding house in Buhl, while the remaining cases visited there frequently. The boarding house was full of flies; the closets were open and in very had condition; the flies circulated between the toilets and the kitchen. Furthermore these toilets had been used by a transient family which had occupied a shack near the boarding house, and had developed 3 to 4 cases of typhoid fever, previous to the outbreak in the boarding house, with an interval just sufficient to cover the proper incubation period. The mine water was exonerated and directions given to correct the conditions of these outhouses; whereupon the outbreak stopped abruptly. This was the result of one day's investigation and was accomplished without analyses of the suspected water. Had these analyses been made however, they would in all probability have shown that the water was polluted, for ocular evidence of that fact was had, and had reliance been placed upon that finding the use of the water would have been forbidden and the incident considered closed. Meantime the polluted closets and the fly-carriage of infection would have continued, undoubtedly the outbreak would have extended to others in the neighborhood and in brief the efforts of the public health authorities would have been wholly wasted in attacking the wrong thing.

TYPHOID FEVER.

Fly Carriage in State Institutions.

Three of the largest state insitutions showed outbreaks of typhoid fever at about the same period. In two of these the outbreaks were confined to the men (employees and inmates) while in the third, women also were affected although to a smaller extent than the men.

In all three the water and milk supplies were promptly eliminated without analyses, partly on account of the known sources of the supplies, chiefly and conclusively on the peculiar distribution of the cases, men and women being approximately equal in all the institutions and all using the same supplies.

In one institution, all the windows were screened **except the kitchen.** Flies were abundant in the kitchen, and accompanied the food trucks to the wards. Once in the wards, the screens there **prevented the escape of the flies.** The whole institution was full of them and it was in this institution that typhoid fever was most prevalent and extended to the females as well as the males.

In this institution efforts to get rid of the flies were necessarily unavailing and the typhoid fever continued until cold weather eliminated them **when it promptly stopped.**

In one of the other two institutions, the women and men dined separately. The men's dining rooms were alive with flies, the women's comparatively free. The flies were not abolished and typhoid fever continued until cold weather eliminated them, **when it promptly stopped.** At no time were the women affected.

In the third institution, the authorities were so impressed with the diagnosis of flies, that 60 inmates were set to work to destroy them in the men's dining room, while every other known method was likewise employed with success. The women dined in their own pavilions, separate from the men. Not a single case developed later than the end of the incubation period of typhoid fever following this abolishment of the flies, i. e., no case became infected thereafter. This was long before the cold weather stopped the outbreaks in the other two institutions.

TYPHOID FEVER.

Water Carriage.

At Two Harbors an investigation showed that after interviewing minutely every case that could be found on the records of any physician every ordinary source of typhoid fever except the city water could be definitely excluded for the primary cases. (Of course there were some secondaries, as is almost inevitable.) Further investigation showed that the sewage was till discharged into the same Agate Bay as it had been heretofore with certain changes. A previous outbreak also investigated by the same investigator had found sewage discharging into this bay, but the sewage at that time consisted in the surface wash and drippings from toilets, collected in an open drain, and reaching Agate Bay, after some meanderings, diluted by rain water, etc. By the date of this second outbreak however sewers had been constructed, and the district, now much developed, poured all of its domestic sewage directly into the system, which was conducted to the same point as before except that it flowed through a septic tank. This tank, a wholly inadequate purification system so far as concerns eliminating danger from typhoid fever is concerned, even when working as it should, was not working properly, not achieving even such chemical purification as it was supposed to achieve.

The result of this investigation showed therefore that Two Harbors was suffering, exactly as it had suffered before, from drinking its own discharges, carried down the bay over the intake and so drawn back into the pipes.

Evidently this infection of the water supply occurred only occasionally because of the immense dilution of the sewage by Lake Superior water. Evidently also it occurred sometimes as had been demonstrated analytically on previous occasions.

The local authorities however preferred to believe in the septic tank and demanded analytical evidence of the impurity of the water. As the evidence epidemiological and engineering was wholly satisfactory to the State Board of Health, and analyses to secure the evidence demanded would have meant the equipment of a small laboratory at Two Harbors, with the detailing of a man from the shorthanded main laboratory staff to conduct it for an indefinite period, the analyses were not made.

DYSENTERY—WITHOUT TYPHOID.

Water Carriage.

It is usual to consider that water supplies are in this section of the country responsible for but one disease, typhoid fever; and it is elsewhere shown that in Minnesota less than half of the typhoid fever is directly traceable to water.

An outbreak at Hibbing demonstrated again what had been four times demonstrated before by large outbreaks in Minnesota, that water may be responsible for sudden severe and extensive attacks of dysentery, with and also without accompanying or subsequent typhoid fever.

The outbreak of bloody dysentery at Hibbing was shown by a house to house investigation to reach the extent of nearly one-fourth of the total water-taking population.

Believing from the accounts sent by the local authorities that only a water infection could account for the outbreak, representatives of both the engineering and epidemiological divisions visited Hibbing and co-operated in discovering the source.

By a rapid process of elimination, the most evident possibilities of infection of the water were quickly discarded by the engineer, while the epidemiologist eliminated possible sources other than the water. Only a heretofore unsuspected method of infection could exist and this was quickly detected when it was found that the day before the outbreak began and ever since, workmen had entered and been busy with changes in the bottoms of the shafts from which the water supply was derived. The local authorities were convinced of the truth of this on Saturday night and the hypochlorite plant advised for its remedy was half completed by them at noon next day. As soon as this plant was installed all dysentery ceased. The plant was continued in operation while the work in the shafts went on, and then discontinued without ill effects.

During this outbreak five deaths from dysentery amongst children occurred. No typhoid fever developed however.

Clinically these cases greatly resembled those already seen at Mankato, previous to the typhoid outbreak, at St. Peter and at the University Agricultural School. (See Mankato typhoid outbreak.)

DYSENTERY, WITH AND WITHOUT ACCOMPANYING TYPHOID FEVER.

Fly Carriage.

At Hibbing, during the period two months subsequent to the dysentery outbreak from the water supply already described, an extensive outbreak of diarrhea quite distinct clinically from that due to the water outbreak occurred.

Inspection and analyses had shown that the hypochlorite plant was operated faithfully and efficiently, eliminating the water supply from the question. Other investigations eliminated all other sources than flies carrying human discharges, perhaps also infection from decaying garbage, etc., to food. Although some cases originated in Hibbing, many were imported from neighboring camps. Later typhoid fever also developed but these were chiefly imported. At many other points in the state, (Coleraine, Taconite, Marble, Virginia, Chisholm, Morris, Tracy, etc., etc.), outbreaks of diarrhea sometimes with, sometimes without typhoid fever occurred. These correlated with good water supplies, milk was invariably eliminatable, contact played its usual part but did not account for the majority especially the primaries. Flies were abundant and the outbreaks occurred chiefly in unsewered towns with exposed closets. **All of those** accompanied by typhoid fever showed this correlation. On the other hand diarrhea alone occurred in some of these towns; and **diarrhea alone** occurred in the few sewered towns encountered. Hence the following tentative deduction which seems to explain all the facts and at the same time coincides with established principles.

First. A sewered town may suffer from fly-diarrhea but not (usually) from fly-typhoid, because the former may be caused by infection of food, milk, etc., from decaying garbage, fresh horse manure, etc., while in such a town typhoid dejecta are not usually exposed to fly access—at least to an extent accounting for a very considerable typhoid outbreak.

Second. In an unsewered town, with non-fly-proof closets, diarrhea may result from fly-carriage as in sewered communities, and also from non-typhoid dejecta exposed in the closets.

If the community is one without "sporadic" or transient typhoid, the outbreak, although due at least in part, to fly-carriage from toilets, will show no typhoid cases, because the dejecta exposed to fly-access are non-typhoidal. But if such a community be invaded by a case of typhoid or a mild, unrecognized, convalescent or "carrier" case, the outdoor, non-fly-proof closet receives typhoid excreta and typhoid, fly carried at once spreads.

Certain communities are sewered only in the "down town" district. This is quite a protection against the introduction of typhoid fever by transients, who usually patronize the hotels, their dejecta, passing into the sewer rather than into open toilets where flies might reach them. On the other hand such an arrangement is very illogical as shown the moment typhoid fever enters the community; for the inhabitants eat and sleep chiefly in the toilet district, where fly carriage is prevalent, working, perhaps taking one meal daily, in the sewered district where fly carriage is unlikely.

TYPHOID FEVER AND DYSENTERY IN SUMMER RESORTS AND IN CAMPS.

Numerous investigations of summer resorts, railroad, mining and other camps on account of diarrhea accompanied by typhoid fever made evident the great need for systematic inspections and for the promulgation of definite regulations controlling the conduct of such places. An interesting group of three summer resorts was investigated at Lake Sarah.

The conditions and surroundings at all three were similar in most respects. Each consisted of a large farm house where the cooking was done and the meals eaten surrounded by a group of cottages or shacks where the guests slept. In each case the water and milk supplies were good and contact was eliminated—as the main cause at least. In all cases open toilets existed.

In one summer resort, the stable was at a distance from the farm house and a windswept knoll intervened. The guests and others united in the statement that flies were not prevalent and diarrhea had not occurred.

In the other two resorts the farm houses and stables were closely adjacent. Inspection showed both dining rooms and kitchens swarming with flies. In both of these resorts diarrhea had been very common. In one, the largest, with a large transient as well as permanent family patronage, typhoid fever also developed.

In the railroad and other camps inspected the same conditions existed; open toilets, swarms of flies in the kitchen and dining rooms, diarrheas extremely common, and in those camps where a typhoid appeared, many followed. In one railroad camp in particular, the typhoid accompanied them upon every move, despite changes in milk and water supply, showing that they carried it with them. On elimination of the fly carriage however, the typhoid was abolished also.

THE MANKATO TYPHOID FEVER OUTBREAK.

General Sketch Showing Typical Results of Local Routine Epidemiological Work.

The Mankato typhoid outbreak of June and July 1908 is quoted here because of the valuable epidemiological statistics derived from its completed returns, the remarkable results of the publicity work in circumscribing primary infections and the successful reducing of secondaries to between one-third and one-half of the usual proportions. Noteworthy emergency epidemiological work in discovering its source or tracing the routes of infection was not called for, the source and routes of the primary outbreaks being obvious almost at a glance.

Source. Owing to a curious combination of physical and meteorological conditions, described in detail in the report of the engineering division the artesian water supply of the city became grossly polluted by the backing up of sewage, on account of high water in the Minnesota river, to an extent which resulted in the contamination of every part of the water system.

A general outbreak of acute diarrhea and dysentery beginning June 25 called attention to these conditions. Dr. A. O. Bjelland, then health officer, telephoned June 29, asking for an investigation. Dr. H. M. Bracken, secretary and executive officer of the Board and Dr. H. W. Hill, then assistant director of the laboratories, responded. Dr. Bjelland described conditions, a visit to the wells was made, and samples were secured for analysis. However the conditions were too obvious to leave any doubt that the infection of the water was responsible for the outbreak, although the exact channels by which the wells became infected was less obvious. Prof. F. H. Bass, sanitary engineer of the Board, and Mr. John Wilson, who was appointed since then city engineer, gradually worked out the very complicated details, which were not brought to completion for some months.

Before leaving Mankato the local authorities were informed of the danger from the water and a tentative prophecy of a typhoid outbreak, after the lapse of the usual incubation period, was made. Orders to boil the water were issued. The hypochlorite method of treating water supplies was then unknown, and no method of rapid complete purification other than boiling by the consumer was available.

The dysentery and diarrhea outbreak fell off rapidly, and the public, aware of the doubts as to the source of the trouble expressed by some of their officials, were unfortunately disposed to wait for analyses from the laboratory before taking precautions which they hoped such analyses might show unnecessary. Despite the warnings issued by the health officer the infected water was more or less freely used during the next two or three weeks. Then in response to notification from Dr. A. O. Bjelland that typhoid cases had begun to appear, Dr. Hill, returned to Mankato, July 17, 1908 and visited the then existing cases, securing epidemiological data and confirming the source of these as due to water supply. Although scarcely necessary, in view of the previous information secured, this work was of value as yielding indisputable evidence with which to confront the doubters in the community and as giving undeniable evidence of the need for instant and vigorous action.

A thorough publicity campaign was at once begun and continued, with vigor for several weeks. The co-operation of the local press in this work, in spite of the more or less evident opposition of some of the business interests prevented much infection and was a large factor in keeping the outbreak both primary and secondary within unusually low bounds.

Meantime provision had been made by the local health officer in cooperation with the local hospitals for the care of the cases as they developed. Since Dr. Bjelland was overworked as health officer and had his own practice to attend to in addition, provision was made for a special health office and the services of Mr. M. C. Piper were secured, to act as deputy health officer and also to secure for the State Board of Health the local epidemiological data, to trace cases and to supervise disinfection. Two visiting nurses were added later, and Dr. A. G. Alley was appointed a special agent to further aid in the multiplied details which developed.

EPIDEMIOLOGICAL DATA AND METHODS.

It was early recognized that this outbreak gave unusual opportunities for the study of statistical epidemiology as applied to an average city of average composition, having practically every inhabitant exposed through its water supply to a severe, sudden but temporary infection.

Hence every effort was made to secure complete first hand data from the patients by men especially assigned to that work and appreciating its importance. Cards were filled out for every case by Mr. Piper, Dr. Alley or Dr. Hill, the data being secured at the bedside or from the immediate household. The information was checked and rechecked as new facts came to light. A special intensive house-to-house visitation, similar to that since recommended by Prof. Sedgwick for the investigation of the typhoid of Washington, D. C., was planned and carried out—special inspections of dairies, milk handlers and others were made, and particular attention was paid to the differentiation of primaries and secondaries. The fact that these researches were made as the case developed, not late in the disease or after recovery, gave to the data secured an unusual reliability in details. Thus not only were the usual data of the epidemiologist secured in the manner and quantity needed for the ordinary epidemiological diagnosis, but this data was so collected, so checked and revised and confirmed as to be worthy of credence as scientific material for the basing of actual permanent deductions concerning such outbreaks.

Some months later the whole mass of data was gone over in detail by Dr. Hill, tabulated, collated, analyzed and interpreted. Especial attention had been paid in the field to the possibilities of secondary milk infections. This was reviewed further, every infected family which possessed even one cow or sold milk being checked against the milk supplies recorded for every patient; itself no small task. Names and addresses were checked and compared. Correspondence was conducted concerning cases infected in Mankato and taken sick elsewhere. A long series of investigations was made by Dr. Alley, moving from place to place about the state as these "outside" cases were found, and collecting the data from these cases in detail. Hence the figures presented are unusually comprehensive and trustworthy. It is of course impossible that they should be absolutely accurate. At the same time, errors large enough to alter the deductions could not have escaped detection.

North Mankato, a small residential portion of Mankato, lying on the other side of the Minnesota river, and having no city water in it, being wholly supplied by small driven wells, acted as an excellent check on the conditions in Mankato.

This outbreak is chiefly remarkable for:

The clean-cut source of infection, its sudden development, and the very short time during which it was operative to any large extent; the equable distribution through the population, the proof (from dysentery and diarrhea) of the infection of practically the whole population; the relatively very small number of typhoid cases resulting (4½ per cent of the population); the remarkably few secondaries; their derivation practically exclusively from their direct immediate contact with existing cases; the abrupt cessation of the outbreak when the main cause was removed; and the almost absolute lack of slow continuance by carriers or convalescents in the succeeding years.

TOTAL CASES AND SUBDIVISIONS.

The Mankato typhoid outbreak resulted in the infection of 511 cases of which we have definite records.

These cases include. First. Primary cases (440), i. e., infected directly by drinking water containing typhoid bacilli in Mankato. Certain of these cases (20) occurred amongst residents in North Mankato. Certain (66) amongst those temporarily in Mankato as visitors or temporarily employed. The majority (354) naturally occurred amongst permanent residents of Mankato.

Second. Secondary cases (71), i. e., infected, not by taking typhoid bacilli into their systems in drinking water, but by taking them directly from existing sick persons—the discharges of the latter reaching the mouths of the secondary cases on fingers (their own or intermediary) or in food infected by the sick, by intermediaries, or by flies. This latter group is important because it consists of cases which were not an essential part of the general outbreak, since they need not have occurred, notwithstanding the primary outbreak, if the theoretically correct sanitary care and sanitary nursing of the patients had been carried out in minute detail. As it was, the unusual sanitary care taken in this outbreak in the nursing of the sick reduced the secondary cases much below the usual ratio of such cases to primary cases.

These secondary cases are likewise divided into those which occurred in North Mankato, those occurring outside, i. e., in communities to which primary cases infected in Mankato returned and were sick, and those occurring in Mankato itself. This division is useful for a number of reasons, and particularly brings out the point that the secondaries were more abundant amongst outside cases than in Mankato and North Mankato, where the publicity, warnings and inspectorial visits continuously given emphasized the danger and pointed insistently to the preventive measures.

TABLE NO. 1.

Typhoid Cases Directly or Indirectly From Mankato Water Infection.

	North Mankato		
	Male.	Female.	Total.
Primary	12	8	20
Secondary	...	2	2
Total	12	10	22

	Outside		
	Male.	Female.	Total.
Primary	26	40	66
Secondary	7	11	18
Total	33	51	84

	Mankato		
	Male.	Female.	Total.
Primary	161	193	354
Secondary	15	36	51
Total	176	229	405

Total primaries	440
Total secondaries	71
Grand total	511

This table represents the best judgment that could be made from the data at hand. It is not always possible to determine whether a case is primary or secondary, so long as the primary source evidently continues to operate. Moreover, it is not always possible to determine just when the primary cause ceases to act. Hence there is often an interval when a double uncertainty must exist—i. e., during that period when it is not clear whether or not infection from the primary source has ceased. Thereafter of course every case occurring must be secondary.

These periods were fairly well defined in the Mankato epidemic by the epidemiological evidence—i. e., that relating to the cases themselves, as distinct from meteorological, engineering or laboratory data concerning the environmental conditions.

CASES IN MANKATO SHOWING DISTRIBUTION IN FAMILIES.

	Families with prim. cases only	Cases in these families	Families with prim. and sec. cases	Prim. cases in these	Sec. cases in these
1 case families	244	244	...	...	...
2 case families	32	64	5	5	5
3 case families	9	27	6	9	9
4 case families	...	...	2	3	5
5 case families	...	...	1	1	4
7 case families	...	...	1	1	6
	285	335	15	19	29

	Families with sec. cases only	Cases in these	Total families	Total cases
1 case families	16	16	260	260
2 case families	1	2	38	76
3 case families	...	...	15	45
4 case families	...	...	2	8
5 case families	...	...	1	5
7 case families	...	...	1	7
	17	18	317	401
Hospitals yielded 4 secondary cases				4
Total				405

Hence of 317 families involved, 32, or about 10 per cent, yielded secondaries. Of the 285 families giving primary cases only, 41 families, or about 14 per cent, yielded more than one primary case, or a total of 91 cases in 41 families.

Of the 32 families yielding secondaries, 16 families showed one case only (but that one secondary), while 16 families showed one or more secondaries. In one of these families there were two secondaries, without any primary within the family. (The first secondary received infection from work in a laundry, handling infected clothing; the second received infection from this first.) The fifteen remaining families showed one or more primaries, followed by one or more secondaries, a total of 19 primaries and 29 secondaries.

In at least four of the sixteen single case (secondary) families, possible walking typhoids in the family existed. In a number of instances (6) certain cases listed as outside Mankato, because their illness occurred elsewhere than in Mankato, were connected with families in town where they were present as visitors or domestics or boarders, etc. These cases, had they been sick in Mankato, would have slightly increased the number of multiple case families in Mankato.

Nurses infected while nursing typhoids in private families were counted as members of the family concerned.

THE GENERAL AGE AND SEX INCIDENCE AS COMPARED WITH THE GENERAL AGE AND SEX COMPOSITION OF THE POPULATION.

A map of Mankato showing both the city water mains and the primary cases indicated a practically uniform and homogeneous distribution, correlating with the city water distribution. Some families and small neighborhoods, using largely private well water even in the city districts, escaped. On the other hand, persons outside the city water district, notably in North Mankato, succumbed, but in all instances, the primary cases of this character were found to use city water while at work or on trips "down town." These exceptions were rather rare, and the North Mankato are separately classified.

Hence in general it was true that this outbreak affected the population pretty generally—and that the cases were drawn, fairly proportionately to the composition of the population, from every class of that population, whatever the basis of classification.

A comparison of the age incidence of the disease with the age and sex composition as given in the census report of 1900 is therefore of interest, although no very minute deductions are proper. It is worth noting that although the average age distribution of the population decreases pretty uniformly as the age increases, the most abundant ages (young children) supply the smallest number of cases. This immunity of children changes at the male group 10-14 years, and thereafter the incidence in the males runs roughly parallel with their numerical proportions in the population. Amongst the females, however, the lines do not become even approximately parallel until the group 35-39 is reached; thereafter the curves of male and female cases are almost identical.

A partial reduction in the discrepancy is seen at the female age group 25-29, but a sharp female rise occurs in the next age group. A marked disparity between the numbers of males and females attacked is seen at ages 15-34, in which it reaches an excess of 78 females over males (109 males, 187 females).

In North Mankato the disparity is small; indeed, there is one male in excess for the group. At 15-24 females are 3 in excess; from 25-34 males are 4 in excess. The absolute figures are small; but seem to correlate with a tendency for the younger females (all except one secondary employed in Mankato) to work in Mankato; the older women remaining at home and escaping infection. The older men, on the other hand (all the men were employed in Mankato), were at work away from home, and naturally in Mankato, where the call for their labors was greatest.

In those counted as outside Mankato, the total disparity is 22 females in excess, 20 of the excess being between 15-24.

The female secondaries (6) are double the male (3) (excess 3). The normal school furnished 4 teachers, 8 students, all females (excess 12). The business college supplied an excess of 1 female. Of visitors, males 16 and females 18, there is little choice. Five female servants against one outside male clerk complete the list of help claiming their homes outside. It is evident, then, that the excess in females in Mankato at the time came from the classes which were in excess in females and from secondaries—women being naturally with the sick more than men, and hence more likely to be infected. Four female normal students are recorded in the Mankato lists, although properly, perhaps, belonging here. This would add to the excess females outside without disturbing the above deductions—rather strengthening them.

Mankato itself shows an excess of 57 females—or 53 if the four female normal students first mentioned be omitted. An actress and a servant, both from outside, might also be subtracted.

The female secondaries were 20, as against 3 males (excess 17). This is due undoubtedly to the fact that the males of these ages avoid the sick, while the females gravitate to them as nurses, etc. But, discounting for outside and secondary females, the proportion still remains (nearly) 4 females to 3 males infected. The census report of 1900 gives females slightly in excess of males, without distinction, unfortunately, as to particular age groups. General information concerning Mankato seems to indicate that females exceeded males decidedly in the general population at the date of the outbreak, but no definite figures are available.

The following conclusions seem justified:

First. That age and sex succumbs to typhoid fever approximately in direct ratio to the exposure to infection; and that equal numbers of males and females, equally exposed, would succumb in about the same proportions, regardless of age, except as concerns the groups below 15 years, and perhaps above 70.

Second. That the apparent excess attack of typhoid fever on the ages 15-29 is due simply to the greater abundance of these ages in the average population. Hence that typhoid fever does not select these ages out of proportion to other ages.

Third. That the relative escape of children under 10 from typhoid fever is established and is more marked than is usually supposed, when the abundance of these ages in the average population is considered. Hence children, when equally exposed (apparently) show a very decided but diminishing escape (whatever the reason for that escape may be) between birth and 10 years old.

SOURCE OF THE TYPHOID INFECTION OF THE MANKATO CITY WATER.

Two distinct outbreaks of two different diseases existed in Mankato as the result of Mankato sewage entering the supply on or about June 25, 1908.

The first, most extensive and that which earliest caught widespread public attention, was termed for convenience the initial diarrhea.

This involved adults and children of both sexes and all ages to the number of 4,000 to 6,000 cases; i. e., fully half of the drinkers of city water suffered. Eleven horses are stated on the authority of a prominent local veterinarian to have shown similar results. Occurring principally as the result of the pollution dating about June 25, the cases showed probable incubation periods of 0-4 or 5 days, with exceptionally longer periods, but these are difficult to fix at all absolutely. Many of those who visited Mankato for but a day during this period and drank the city water contracted diarrhea, but the date on which the diarrhea occurred as compared with the date of drinking water is not recorded in any such case.

In one instance death occurred indirectly attributable to this diarrhea. A female aged about 40 visited Mankato, drank the water and almost at once developed very violent vomiting and purging, dying on the same evening. The actual cause of death was cerebral hemorrhage, induced by the exhaustion and strain. This was the only death attributable to this disease in Mankato.

The disease clinically varied very much—from mere passing looseness with or without slight pains and general ill-feeling to fulminating attacks quite like ptomaine poisoning in their violence and the extent of the collapse. Some cases lasted a day or two, others a week or two.

More cases had typhoid subsequently than not, but that there was no connection between this diarrhea and the typhoid fever is shown elsewhere.

Experiences in St. Peter in July, 1908, in 1909; at the University Agricultural School in 1907, and in Hibbing in 1910 show that this diarrhea may occur without a subsequent typhoid fever. These four outbreaks of diarrhea furnished respectively 300-400 cases, 300-400 cases, 400-500 cases, 1,600-2,000 cases, in each instance involving a very large proportion of the total water-takers. The clinical symptoms, and especially the wide variation in severity and in the length of the attack, were similar in all instances. All four of these outbreaks were due to water-infection, no one of the four resulted even a single case of typhoid fever. In one instance the infection was due to the admission to the artesian water supply of ordinary domestic sewage. In one instance it was due to laborers working in the deep shafts from which the water supply was derived. In the other two instances it was due to infection of artesian water with river water, at that time in flood, the river water bearing at the time the sweepings of the river valley above the point of infection and the sewage of at least one city, greatly diluted, however.

Other outbreaks of a similar character, some associated with typhoid fever, some not, have been encountered in Minnesota and traced conclusively to fly-carriage of human discharges from outdoor toilets or similar exposed deposits of human feces and urine, possibly to garbage (?) or horse manure (?).

Hence we absolutely know from our own studies that the admission of human discharges to human food or drink may have, according to circumstances (the amount of the discharges or their character, or both), effects non-typhoidal but extremely severe or extremely mild or intermediate in character, quickly passing off, or, on the other hand may result in typhoid fever, with or without associated cases of dysenteric character.

We have every reason to believe that, while we do not know just why or when or how, intestinal disturbances other than typhoid are thus precipitated, we do know that typhoid fever cannot occur unless the discharges taken with the food or drink contain the typhoid bacillus. Thus we are safe in saying that in the outbreaks at St. Peter, the Agricultural School and at Hibbing, above referred to, typhoid bacilli were not present in the material which infected the supplies. On the other hand, where typhoid fever occurs, we know that human discharges containing typhoid bacilli were involved, for this is the only known source of typhoid bacilli, and, moreover, fully accounts for all instances.

Hence the development of typhoid fever at Mankato from the city water demonstrates not only the pollution of that supply with human discharges, but also the pollution of that supply with **typhoid-infected human discharges.** The initial diarrhea is fully and completely explained by the admission of human discharges to the supply, whether these included typhoid discharges or not. The typhoid outbreak makes it certain that the discharges contained typhoid bacilli also.

Whence came these typhoid bacilli? The most careful search of the records of hospitals and physicians' records showed no typhoid fever cases contributing to the sewage for many months previous to the outbreak, with the exception of one case, infected elsewhere and sick at home during the preceding December, January and February. On recovery this patient continued to work in Mankato.

It is not to be believed that the discharges of this patient so infected the sewage in February that at the end of June enough bacilli remained to precipitate the Mankato epidemic.

The possibility that this patient might have become a chronic carrier voiding typhoid bacilli more or less continuously infecting the sewers up to the end of June must be admitted.

Examinations of this patient's feces and urine were made to elucidate this point, but bacilli were not found, nor does any history exist then or since of associates of this patient contracting the disease—as there would probably be were this patient a chronic carrier.

Hence we are forced to conclude that the typhoid infection unquestionably present in the city water was derived from the discharges of persons unknown, probably transients, early cases, convalescents, walking cases, or even carriers, amongst the general population in Mankato at this period.

Transients are common in Mankato—traveling men, business men of all descriptions, visitors. At the end of June the normal school, drawing widely from all over Minnesota, business colleges, etc., were running. A ministers' convention met June 24-30. A circus was present June 25. Hence Mankato had every opportunity to entertain many infected persons.

THE DATE OF FIRST INFECTION OF MAINS.

The initial diarrhea, in persons later developing typhoid, so far as definitely dated, occurred on June 25 in 27 cases, June 26 in 7 cases, June 27 in 2 cases, July 4 in 1 case. The intensive investigation discovered it in persons not developing typhoid as originating June 25 in 13, June 26 in 34, June 27 in 2, July 1 in 2, July 4 in 5, "June" in 13, "July" in 1. These included Mankato and North Mankato people. Amongst the typhoid cases which developed outside Mankato, some are recorded as being in Mankato but one day; others two, three or four days only. It is significant that no outside typhoid case developed as the result of any visit terminated previous to June 25. Of those in Mankato on June 25 only, who later had typhoid, eleven developed diarrhea; on June 27 only, one developed diarrhea. Six cases present in Mankato from two to eight days, beginning June 24, developed diarrhea. A single case, attributed to drinking Mankato water on July 18 only, showed some initial diarrhea. In no other case is diarrhea attributed to drinking the water later than July 4.

Thus a total of 51 cases of diarrnea definitely correlate with infected water as early as June 25, but not one case earlier. The incubation period of this diarrhea is, we have reason to believe, from a few hours to several days. Hence there is conclusive evidence of infection of the water on June 25, but no evidence of any earlier infection.

THE CONTINUITY OF THE INFECTION.

From the admittedly meager data on incubation periods (21 definite and 10 indefinite) we may tentatively calculate that taking the intermediate figure in each "indefinite" as the true period for that indefinite, we have 31 incubation periods which may be arranged thus:

Fifth day, 2; 7th day, 1; 8th day, 2; 9th day, 1; 10th day, 2; 11th day, 3; 12th day, 1; 13th day, 1; 14th day, 1; 15th day, 3; 16th day, 1; 17th day, 3; 18th day, 5; 19th day, 1; 20th day, 2; 24th day, 1; 29th day, 1.

Hence, of 31 people infected on a given date, there would be three (3) who showed symptoms within one week later, eleven (11) within another week, fifteen (15) within the third week, one (1) in the fourth and one 1) in the fifth week.

Without attaching too much importance to the actual relative proportions in which the different incubation periods occurred in this outbreak as representative of the usual proportions, it is nevertheless very curious and interesting to note that if we assume a violent infection on June 25, continuing but diminishing so that but two-thirds as many were infected by the end of the first week and but one-sixth as many by the end of the second week, we obtain the following proportions:

	1st Week	2nd Week	3rd Week	4th Week	5th Week	6th Week	7th Week
Proportion for 31 people	3	11	15	1	1	......	......
Proportion for 186 infected at beginning of 1st week	18	66	90	6	6	......	......
Proportion for 124 infected by the end of 1st week	......	12	44	60	4	4	......
Proportion for 31 infected by end of 2nd week	......	......	3	11	15	1	1
Theoretical results by dates of earliest symptoms (341)	18	78	137	77	25	5	1
Actual returns 349 by dates of earliest symptoms	13	75	151	75	21	12	2

This rather startling parallelism between the purely theoretical and the actual returns is somewhat further enhanced if in the fifth week be added two cases returned as possibly secondary. So far, then, it would appear that the water was indubitably infected June 25 to July 9, and that an infection between these dates would account for nearly all the cases which showed symptoms to July 30.

Two factors would account for a decided diminution in the numbers infected at the end of the first week—notification that the water was infected, with directions to boil it, made June 29-July 1 and gradual dilution of the infection by inflowing pure artesian water, probably also the natural dying out of the bacilli. These factors doubtless continued to operate during the second week; yet some persons continued to drink the raw water to the end of the third week after infection, doubtless thus extending the primaries. The typhoid infection of the mains seems to have continued on other evidence, at least as late as the 18th (3 visitors) and perhaps the 25th (1 visitor), as on these dates visitors to Mankato for one day only became infected. By this time residents almost without exception had abandoned the use of raw water, many boiling even well water, wholly unconnected with the city supply. In certain instances, however, Mankato residents not exposed to secondary infection, so far as careful investigation showed, admitted drinking city water late in July and contracted the disease, but these cases might have been secondaries.

It may be considered that 30 days (June 25 to July 25), or even 23 days (June 25 to July 18), is a rather long period for typhoid bacilli to remain in water capable of producing typhoid fever, especially in view of the constant dilution and washing out due to constant influx into the water main system of artesian water.

The usual period of persistence of infection in a surface water exposed to sun and air and not changed by inflow and outflow is currently held to be not longer than two weeks. Whether or not this period has ever been determined, in view of the proportionate distribution of varying incubation periods as given above, is unknown to the writer. Nevertheless, there is evidence first obtained here in 1907, from records of the Breckenridge typhoid, that the shutting out of sunlight and air by ice in winter on the Otter Tail river conduced to greater longevity or virulency or both, of the typhoid bacilli. This was later noticed by Ruediger regarding the Red

Lake river, and still later worked out experimentally by him, with quantitative experiments on the actual reduction in longevity of typhoid bacilli in Red Lake river water in summer as compared with winter.

Now, artesian water flowing directly into mains would, if infected, be somewhat in the same condition as regards light and air as surface water in winter flowing under ice. Hence it would be proper to expect a greater longevity of infection in mains under the Mankato conditions than in an open surface water.

Unfortunately for all concerned, it cannot be demonstrated from engineering, meteorological or other data that the mains received infection on June 25 only. Indeed, it is not improbable, although not now to be proved, that the mains received new infection for some time—how long cannot now even be guessed. Hence there is no way of determining with any degree of certainty that typhoid bacilli survived in the mains for a greater period than they would have survived in surface water. On the hypothesis that a single infection only occurred (on June 25), it would appear conclusively that they existed at least two full weeks, almost conclusively, for 23 days, with some evidence for 30 days.

The relation of an attack of the initial diarrhea to the development or non-development of typhoid fever in the same persons:

Initial Diarrhea.	Typhoid.		
+	+	=	206 persons
—	+	=	53 persons
+	—		253 persons
—	—		144 persons

Total with initial diarrhea.....=459 (typhoid followed in 206)
Total without initial diarrhea..=197 (typhoid followed in 53)

Hence nearly half of those with initial diarrhea had typhoid, while only a little over one-fourth of those who did not have the initial diarrhea suffered later from typhoid fever.

It would seem, then, that there was no evidence, as has been supposed, that the initial diarrhea purged the system of the typhoid bacilli and so reduced the tendency to typhoid.

The question of how many persons suffered in Mankato from the initial diarrhea may be answered approximately by these figures. Thus, of the 397 non-typhoid persons showing data, 253 suffered the initial diarrhea. Hence, if the 10,000 water-takers in Mankato suffered in approximately the same proportions, about 6,000 had the initial attack. This figure is not exaggerated, as inquiry showed that the majority of those questioned admitted an attack.

Hence we know that these 6,000 yielded 206 cases of typhoid.

We know that the 4,000 remaining yielded 53 cases of typhoid; data on the remaining 96 primary typhoids is indefinite on this point.

Hence those who escaped formed two-thirds of those who suffered from the initial diarrhea; but they supplied only one-fourth as many cases of typhoid.

POSSIBLE INFECTIONS THROUGH MILK.

The milk supply of every patient was carefully inquired into, in order to determine whether or not milk might be a factor in the outbreak. The great variety of the milk supplies of the cases, especially of the early cases, and the uniform, general homogeneous distribution of the cases wherever the Mankato city supply was used as drinking water, quickly and conclusively excluded milk as responsible for the main outbreak. The question still remained was milk a factor first during the primary outbreak, due to the infection of milk by early cases amongst milk handlers; or, second, to use of city water to wash cans or even to dilute milk; or, third, by the returned, milk-filled, to new families, of improperly cleaned milk bottles, collected from infected families.

Not only direct inquiry at the houses of patients, but inspections of milk supplies and examination of the "help" were made, the latter in order to detect possible sick or convalescent handling the milk. Further, the data obtained was most exhaustively tabulated and cross-checked—the patient sorted out by milk supply, the milk supplies checked against the cases amongst their customers, dates of infection of patients were compared with dates of infection of milkmen when these showed histories of attacks.

A priori, anyone familiar with the usual milk supply of the usual Minnesota community would hardly expect any great outbreak to occur from milk, for the great milk routes hardly exist here as yet, and although customers of any one milk supply may run into tens of families, they rarely reach to hundreds. Nor are these milk dealers likely to handle mixed milk from great contractors. They deal pretty directly with the original cow owner as a rule. Hence the chances for any great outbreak such as are on record in Eastern cities do not usually exist.

The 405 patients in Mankato were distributed to different milk supplies thus:

Milk supply No. 1........................= 50 patients
Milk supply No. 2........................= 32 patients
Milk supply No. 3........................= 19 patients
Milk supply No. 4........................= 16 patients
Milk supply No. 5........................= 16 patients
Milk supply No. 6........................= 15 patients
Milk supply No. 7........................= 13 patients
Milk supply No. 8........................= 6 patients
Own cows ....= 31 patients
Neighbors' cows ....= 172 patients
Condensed milk ....= 1 patient
Not given ....— 34 patients

Total .... 405 patients

(Six patients received milk from two sources each, hence the above total is 411, representing 405 patients.)

The 405 patients had over 100 separate sources of milk supply. (Some "neighbors" and small dealers supplied two or more patients each.)

The 22 patients in North Mankato showed:

Mankato milk dealers.....................= 4 patients
Own cows ....= 4 patients
Neighbors' cows ....= 14 patients

The 84 outside patients showed:

Mankato dealers ....= 16 patients
Own cows ....= 48 patients
Neighbors ....= 7 patients
Not given ....= 13 patients

The "outside" cases receiving milk from Mankato dealers were those who lived in Mankato for some little time, although sick at home elsewhere; the very large proportion of own cows is due to the fact that many were farmers. It must be admitted that the outside cases which were only in Mankato a very short time could seldom give their milk supplies while in Mankato. But, so far as possible their known residences in Mankato were checked against the milkmen known to supply these residences.

The search for secondary milk outbreaks failed except to reveal possible sources, as follows: Of those supplying milk in Mankato to other people, all dealing on a very small scale, a number had typhoid themselves or in their families, while one large firm had one milker sick with typhoid, and another large firm employed a boy to cap bottles whose sister had typhoid, and he himself contracted it later.

Taking into account customers of these who contracted typhoid in from one to three weeks after the date of onset in the possible infector, we find six infected small milk dealers having one case each develop amongst their customers within this period; but these cases might equally well have developed from the city water. We find two cases possibly due to the infected boy bottle-capper, but also subject to water infection; and the fact that there were only two out of a large list makes it unlikely that the milk was the source; again, nine cases occurred after the milker mentioned above, but these also were exposed to water infection, and owing to the mixing of milk before sale, he could hardly have infected so small number of the large clientele.

Finally, two cases developed early while using the milk of a small dealer where typhoid existed, and two more cases developing long after the mass of the epidemic were still using the same milk. The two later cases were brothers, and both the father and a sister had had typhoid and were then convalescent. It would be difficult to determine the milk as the cause of any of these.

Hence it may be concluded that milk had nothing to do with the primary outbreak, and that no evidence has been obtained showing even secondary infection from milk, although the possibility of secondary infection in this manner must be allowed in a total of 21 cases, for most of which primary infection from the water was the most probable explanation.

POSSIBLE INFECTIONS THROUGH FLIES.

There were one or two secondary cases in which the investigation made gave small satisfaction as to the exact route of the infection from infector to infectee.

Flies as a carrier of typhoid fever, in a well-sewered community where the excreta are promptly disposed of into the sewer, show few, if any, instances of fly infection from house to house, although careless exposure of filled or unwashed bed pans in houses or on porches, etc., with fly access to them, may give occasional house infections or a limited number of house-to-house infections.

In Mankato unusual care as to disinfection and disposal of excreta was the rule, and sewer connections were fairly constant in the city water district; hence it is not surprising that fly infection should be the only available explanation in extremely few cases. The "clean up" of the city by the local health authorities undoubtedly minimized the breeding place of flies also.

WALKING CASES.

An "intensive" or house-to-house investigation carried out by the medical inspectors and district nurses covered 193 families, taken as they came on certain streets in certain districts so selected as to average the conditions in the city as nearly as possible. This investigation was designed to discover the number of persons affected by initial diarrhea in families where typhoid did not occur, and also to determine how thoroughly the orders of the health authorities regarding the boiling of water and milk were carried out. The results are probably far from accurate in individual cases, but probably also represent the average condition fairly well. Incidentally, cases of possible mild or walking typhoid not reported by physicians were sought for.

Results of intensive investigation:

Families=193. Adults=395. Children=503.

Families affected=78. Adults=78. Children=104.

Typhoid cases already reported=19.

Possible walking cases discovered, 17.

For a variety of reasons, blood tests of the suspected walking cases were not made.

Thus, of a total of 898 individuals, about one-fifth are recorded as having the initial diarrhea. This proportion is not as high as that derived from data taken from patients and patients' families. But also the number of typhoids amongst these families indicated a smaller percentage of cases in the whole population than was actually the case (i. e., only one-half the due proportion are here recorded). The explanation of both apparent deficits lies in the fact that a large number of families here investigated were users of well water, and hence escaped the wholesale infection which occurred amongst city water drinkers.

The number of apparent walking typhoids nearly approximates the number of recorded cases in this population, and hence this outbreak is apparently an example of the dictum established by Eastern epidemiologists that the recorded cases of typhoid fever are in general but about half the total cases.

SECONDARIES.

In an outbreak like that at Mankato, the cases derived from the original environmental source (in this instance water) are known as primaries—those derived more or less directly from these primaries, by more or less direct transfer of the patient's discharges to the prospective victim's mouth, on hands, food, milk, or by flies conveying discharges to food, milk, etc., are known as secondaries. Strictly speaking, there is no logical distinction between primary and secondary, for both are infected only by receiving into their mouths the discharges of previous cases. Hence every typhoid case is secondary to some other previous case, and, too often also, primary to some other subsequent case. But it is convenient to speak of the originals, so far as traced, as primaries, and of those traceable to the primaries as secondaries.

Hence the primaries in this instance are those infected by drinking the city water, the secondaries those derived from the primaries. In a few instances, secondaries gave rise to still other secondaries (tertiaries), but anyone who has clearly in mind the fact that typhoid fever (like the other communicable diseases) never arises de novo, but always traces itself back by an endless chain from patient to preceding patient, must appreciate that this term is not very valuable.

A list of the secondaries is given below, in order that a judgment may be found of the evidence for and against their derivation from the water or from direct exposure to other cases.

The distinction in Mankato between primaries and secondaries is clear enough at the extremes of time. Thus, as indicated above, it is more than probable that all cases whose dates of earliest symptoms were not later than the third week after June 25, i. e., not later than July 16, were unquestionably, primaries. Owing to the extreme probability that the water was infected, at least to some extent, as late as July 9, cases developing symptoms within three weeks of this latter date, i. e., by July 30, are in all probability attributable to the water also, although some of these occurring late in July, especially where they were associated with cases sick early in July, might also be secondaries. Since there is some evidence that infection of the mains persisted until July 18, perhaps even the 25th, it was possible that primaries might occur as late as August 8, or even August 15. But that they would not occur in any great number, especially amongst the residents in Mankato, is guaranteed by the great fear of the water inspired by constant and strenuous publicity. Where family contact, or especially nursing the sick, could be shown in cases developing after July 30, the cases are considered as probably secondary. On this basis there were in Mankato:

Secondary males, 15; secondary females, 36. Total, 51.

In three females (Nos. 351, 246, 370) the evidence is quite inconclusive. For reasons given above, 5 others (females) might have been infected from water as well as by contact with other females, the presumption is strong that they were secondaries. Thus a total of 3 males and 12 females have at least some doubt as to origin. The remaining 32 can hardly be questioned as certainly secondary.

For the purposes of the following classification, I have assumed that 15 males and 36 females were secondary.

AGE CLASSIFICATION OF MANKATO SECONDARIES

Years	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Males, 15; adult males, 6	2	1	...	1	...	1	1	...	1	1	...	...	1	...	...	...	...	...
Females, 36; adult females, 17	1	...	1	1	3	1	...	2	....	1	1	1	1	...	4	...	2	...

Form of Exposure

Nursing sick	Males, 2	Females, 10
Family contact	Males, 8	Females, 16
Flies	Males, 1	Females, 1
Laundry	Males, 0	Females, 2
Not given	Males, 4	Females, 7

AGE CLASSIFICATION, OUTSIDE SECONDARIES

Years	3	10	11	13	15
Males, 7; adults, 3	1	....	....	2	1
Females, 11; adults, 7	....	1	1	....	2

Form of Exposure

Nursing sick	Males, 0	Visiting sick	Males, 1	Family contact	Males, 6
	Females, 4		Females, 3		Females, 3

Note—One female (45) was evidently doubtful as to derivation from Mankato at all, North Mankato presented 2 female secondaries only.

Thus the total secondaries, possible, probable and certain, were 71. They formed, therefore, nearly 14 per cent of the total cases. The 290 females yielded 49 secondaries, or 17 per cent. The 221 males yielded 22 secondaries, or 10 per cent.

The usual percentage of secondaries in most such outbreaks seems to be 25 per cent. Hence at least 51 secondaries were saved by the strenuous inspection and publicity of the public health work done.

This, however, is hardly a fair estimate for this publicity acted chiefly in Mankato.

Of 405 cases in Mankato, 51 were possibly secondary, or 12½ per cent, cutting the usual percentage in two. If only 32 be allowed as known secondaries, the percentage in Mankato becomes 8.6 per cent.

Outside of Mankato where these efforts did not extend, there were 84 cases, with 18 secondaries, or 21½ per cent, which approximates the usual figure.

In North Mankato, the percentage is just under 10 per cent, but the number of cases was too small to be of much value.

Secondary infection within households due to the infection of the nurse who is caring for the sick at home, or to "family contact," i. e., the fact that the nurse, trained, untrained or perhaps a members of the family, usually the mother or older daughter, carries the infection to her own mouth or to those of the family, by transferring the discharges of the patient to food, milk, dishes, etc., must be distinguished from secondary infection from outside the family. The latter is introduced by flies, by visiting sick, or visitors from the sick, by visitors or associates suffering from unrecognized or walking cases, early mild cases, or during convalescence; also by carriers or by infection of milk or other food coming into the family, by washing typhoid infected clothes, etc.

Infection within the family is both more difficult and more easy to avoid than infection from outside the family—more difficult because of its concentration, the continuity of its presence and the exhaustion and worry of the family consequent on its presence; more easy because the routes of infection are so well known and the methods for prevention spread so simple; more difficult because these sources and routes must be unremittingly watched minute by minute; more easy because such watchfulness is possible as it cannot be with regard to the multiplicity of possibilities from without.

It is distressing to note the number even of trained nurses who infect themselves and therefore doubtless others. It is rather evident that increased training and increased caution is needed on the part of trained nurses as well as of untrained nurses.

The teaching that typhoid fever is not contagious has been responsible for a very great number of cases and deaths, wholly and absolutely avoidable, and the avoidance was wholly in the control of those who became infected thus, had they but known or appreciated the facts.

Perhaps the other most pernicious teaching regarding typhoid fever is that which relates its spread almost wholly to water supplies.

While it is true that, as this Mankato outbreak demonstrates, the great outbreaks which catch public attention and are remembered are usually water outbreaks, yet probably one-half to two-thirds of the total typhoid of Minnesota is not water typhoid, but due to contact, flies and milk infection.

The State Board of Health has combated for years both of these pernicious teachings, and at length are beginning to feel that they have impressed the public and professional mind to some extent.

THE TABULATION OF TYPHOID CASES FOR EPIDEMIOLOGICAL PURPOSES.

Too often in routine state and municipal records, and even in the face of epidemics, typhoid cases are listed by the date of the report made by the physician. The rise and fall of the outbreaks, and even the date when the infective period began, is then based upon the tables thus constructed.

When it is remembered that the average period of incubation is two weeks, varying from 5 to 21 or more days, that the period between the development of earliest symptoms and the first visit of the physician is six to seven days, varying from 2 to 21 days, or even more; that the physician is likely to arrive at a satisfactory diagnosis of typhoid fever only after two to six or eight days' observation, and perhaps a Widal test or blood test; that the physician usually reports without hurry, and often after considerable delay, if at all, it is easy enough to appreciate that on the average tabulated records by dates based on physicians' reports indicate nothing but crude and very misleading outlines; and that to get the facts every case must be retabulated on the basis of the date of earliest symptoms before the true curves of incidence can be determined, while the date of infection cannot be properly determined by applying merely the average incubation period to these corrected figures, but requires the application of a formula, indicating the relative proportion of the chief lengths of incubation usually found, rather than a crude average of all

That these are not mere technical requirements, but very serious and important factors in the handling of typhoid fever, can be easily shown.

Nothing is commoner than to find outbreaks tabulated by the dates on which they were reported by physicians, attributed to causes operating in the month of report, whereas on the average the time of infection was a month earlier. I have seen long series of years of cases considered as autumnal typhoid, and efforts made to explain them as such, when a little consideration would show that these cases were really summer typhoid. Time and again I have encountered outbreaks attributed to specific occurrences on specific dates, occurring **just before** the (reported) outbreaks, the nearness of these specific occurrences to the reported outbreak being, as a matter of fact, conclusive evidence that the two things were unrelated.

The psychology of reporting on the part of physicians enters very largely into the dates of reporting. In the very beginning of an epidemic there is apt to be some delay in reporting, because the first few cases are diagnosed with extreme caution (if typhoid be rare in the community) or regarded as commonplace occurrences about which there is no hurry (if typhoid be not unusual in the community). Later on, as word gets about that an outbreak is developing, physicians become more and more on the **qui vive**, diagnoses are made without the same hesitation, and as stress of fear of impending disaster develops, are reported promptly. Still later, if cases come thick and fast, the existence of a catastrophe becomes an accepted matter—the feeling that the authorities have been aroused and are attending to the outbreak develops, and the physician becomes immersed in the strenuous task of caring therapeutically for a wholly abnormal number of cases. Hence promptness in reporting falls off again. "What matters a case more or less now, when there are so many? I will report tomorrow or next day—or will wait till I can report six or eight at once, and make one job of it." Hence peculiar bunching of cases occur, due purely to psychological factors; yet often puzzled over and even "explained" later on, by attempting correlation with physical occurrences, absolutely unrelated thereto.

The only remedy for this confusion and misapprehension lies in the systematic epidemiological investigation of every case as soon as reported.

THE INTERVAL BETWEEN THE EARLIEST SYMPTOMS AND THE PHYSICIAN'S FIRST VISIT.

In typhoid fever, the date on which the patient begins to feel sick averages 14 days later than the date on which the infection was received, i. e., the date on which the typhoid bacilli entered the patient's mouth. These "earliest symptoms" are indefinite and are usually disregarded at the time, only being remembered later when the patient becomes definitely and unmistakably ill. The interval between these two dates is of considerable importance. It is sometimes quite short, often prolonged—and it is well known that light ambulatory (walking) cases exist in which definite illness, sufficient to send the patient to bed or to require the services of a physician, does not develop. Of course, illness which some people would disregard or struggle along with, sends others quickly to bed.

In Mankato, of the 405 recorded cases, 319 gave an average interval between earliest symptoms and the physician's first call of 5.6 days, i. e., the physician called on the sixth day after the development of the first symptoms. The remaining 86 cases gave no data, or indefinite data, or gave an interval of no time, or one day only, between the two dates.

It may be taken as firmly established that no physician ever sees a typhoid case on the true date of earliest symptoms except by accident or under extremely unusual circumstances. So also it is very seldom that the patient is seen professionally after but one day of this condition. Hence in these 86 cases the earliest symptoms were ante-dated six days from the date when such case was first seen, and so appear in Table No. 1.

North Mankato showed but 4 out of 22 cases with unacceptable intervals between earliest symptoms and the date first seen by a physician.

Outside Mankato yielded 24 such cases out of 84.

It is of considerable interest to note that while the average interval in Mankato was 5.6 days, the average outside Mankato was 7 days, and in North Mankato 7½ days, i. e., the Mankato patient was seen on the average on the sixth day, the "outside" patient on the seventh day, the North Mankato patient on the eighth day.

The explanation of these differences is not perhaps hard to find. Mankato was inhabited by a mixed well-to-do population, all but panic-stricken, thoroughly posted on what might happen and tending to look upon any indisposition as possible premonitory symptoms of typhoid fever. North Mankato was inhabited by a financially less well-to-do population, more chary of unnecessary expense and not panic-stricken, because not supplied with the infected water. The outside cases were, as a rule, persons who were infected as the result of a short stay only in Mankato. They did not as a rule look forward to possible development of the disease, and when it appeared did not appreciate its seriousness early. That this explanation is not far-fetched may be shown by the fact that patients in general show about seven-day intervals all over this state, except in parts of Northern Minnesota, where the payment of a monthly fee secures the services of the physician. There the typhoid patient goes to see a physician usually the third or fourth day of the attack.

The logical deduction is, then, that the date of going to bed of the patient averages 21 days from the date of infection. This point is brought out also in the table of incubation periods.

INTERVAL BETWEEN EARLIEST SYMPTOMS AND THE FIRST CALL OF A PHYSICIAN.

North Mankato—(18 cases gave data.) Av.=7.5 days, i. e., the physician called on an average on the eighth day.

Days	2	3	4	5	6	7	8	9	10	11	12	13	14	15	6	17	18	22
Cases	2	5	3	2	1	1	0	0	0	1	0	0	0	0	0	0	1	1

It must be noted, however, that over half the cases were seen before the fifth day.

Mankato Cases—(Over 300 cases gave data, nearly all here listed.) Av. 5.6 days, i. e., the physician was called on the average about the 6th day.

Days	2	3	4	5	6	7	8	9	10	11	19	21	2
5 Cases	55	57	53	42	18	55	12	12	4	3	2	2	

It must be noted that over half the cases were seen before the fifth day. (Some scattering intervals were not given.)

Outside Cases—(Fifty-eight cases gave data.) The average was 7 days.

Days	2	3	4	5	6	7	8	9	10	11	12	13	14	20
Cases	8	3	5	10	5	7	2	3	5	1	4	1	3	1

It must be noted that half the cases were seen before the seventh day.

These tables show the effect of publicity and the fear of typhoid in Mankato and North Mankato, driving people to consult a physician early—as soon as symptoms began. Outside Mankato the average conditions existed and a physician was not called until the symptoms became more severe.

INCUBATION PERIODS.

The incubation period of typhoid fever is the interval between the date of infection and the date of development of the earliest symptoms. As outlined in considering the period between the latter date and the date the case is first seen by a physician, it is often hard to fix accurately the date of earliest symptoms. Hence, although the incubation period is generally considered as averaging 14 days, some epidemiologists prefer to fix the date of infection as 21 days before the first visit of the physician, or the date of going to bed, rather than at 14 days before the date of the earliest symptoms. The writer suggests a new method based on these incubation periods and applied to the question of the continuity of the infection. (See pp. 218-219.)

Number	Sex	Age	Period from date of infection to "1st seen"	Incubation period
18	F	24	11	5
10	F	19	24	10
72	F	16	13	11
74	F	15	25	15
60	F	20	13–21	7–15
9	F	20	19–22	16–19
11	F	15	25	18
56	F	27	25	18
76	F	26	21	16
79	F	17	34	29
8	F	21	34	14
61	F	11	25–26	19–20
17	F	12	30–33	22–25
			Range 11–34 Av. 9 def. 24 4 indef. 23 (range 13–33)	5–29 (omitting 29–5–18) 15 (omitting 29–14) 18 (range 7–25)

INCUBATION PERIODS

Number-	Age	Sex	Period from date of infection to "1st seen"	Incubation period
7	15	M	19–20	17–18
81	18	M	26	17
55	20	M	19	7
30	21	M	11	5
15	21	M	20	15
31	22	M	17	12
82	24	M	19–25	16–22
63	26	M	31	20
5	28	M	16–22	10–16
20	28	M	28	18
71	30	M	16	8
80	30	M	24	17
83	32	M	15–18	9–12
34	34	M	20	10
77	44	M	14–15	6–9
59	44	M	12	8
4	14	M	29	17
1	39	M	19–25	12–18
			Range 11–31 Av. 12 "def." 21 Av. 6 "indef." 19 Range of "indef." (14–25)	5–20 13 14 (8–22)

APPENDIX—TABLE No. 1

All Cases Belonging to Mankato Outbreak

JUNE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		To-tal
Mankato, male, primary....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mankato, female, primary...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	2	...	...	4
JULY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	To tal
Mankato, male, primary....	4	...	1	8	4	6	4	4	7	13	13	11	8	6	5	7	7	8	6	10	4	1	3	1	4	3	...	...	...	1	2	151
Mankato, female, primary...	5	...	1	6	2	9	6	8	9	16	14	16	11	11	5	15	6	8	5	6	5	5	1	5	4	1	...	2	...	...	...	182
Mankato, female, secondary.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	1	...	2
No. Mankato, male, primary	1	...	...	...	1	1	...	...	1	...	1	1	...	1	1	...	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	11
No. Mankato, female, prim'y	...	...	...	1	1	1	1	1	1	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	8
No. Mankato, female sec'd'y.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1
Outside, male, primary......	1	...	...	2	1	1	1	...	...	3	...	5	2	...	3	...	2	...	...	...	...	...	1	...	1	1	...	...	...	...	...	24
Outside, female, primary....	2	...	...	...	2	5	3	2	3	4	3	1	3	...	2	...	1	4	...	1	1	...	...	1	...	...	...	...	...	...	...	38
Total Mankato, primary....	9	...	2	14	6	15	10	12	16	29	27	27	19	17	10	22	13	16	11	16	9	6	4	6	8	4	...	2	...	1	2	333
Total No. Mankato, primary	1	...	...	1	2	2	1	1	2	1	1	1	1	1	1	...	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	19
Total Oustide, primary.....	3	...	...	2	3	6	4	2	3	7	3	6	5	...	5	...	3	4	...	1	1	...	1	1	1	1	...	...	...	...	...	62
Total Mankato, secondary...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	1	...	2
Total No. Mankato, second'y	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1
Grand total...........	13	...	2	17	11	23	15	15	21	37	31	34	25	18	16	22	16	23	11	17	10	6	5	7	9	5	1	2	...	2	3	417
AUGUST	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	To-tal
Mankato, male, primary....	3	1	1	...	1	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7
Mankato, female, primary...	2	1	...	...	1	...	...	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6
Mankato, male, secondary...	...	...	...	...	...	1	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	1	...	...	...	...	...	6
Mankato, female, secondary.	...	...	...	2	...	1	...	...	1	1	3	1	...	1	1	1	2	...	2	2	...	3	...	...	...	1	...	2	...	1	...	25
No. Mankato, male, primary	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
No. Mankato, female, sec'dy	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Outside, female, primary....	1	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Outside, male, secondary....	...	1	...	...	...	1	...	...	...	...	...	1	...	...	...	...	...	1	...	...	...	...	1	...	...	...	...	...	...	...	...	5
Outside, female, secondary...	...	...	...	1	...	...	...	...	1	1	...	...	...	...	1	...	...	...	...	1	...	...	...	...	...	...	...	...	...	1	...	6
Mankato, primary.........	5	2	1	...	2	...	...	1	...	...	...	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	13
Mankato, secondary.......	...	...	...	2	...	2	1	1	1	1	3	1	...	1	1	1	2	...	2	2	...	3	...	2	...	2	...	2	...	1	...	31
No. Mankato, primary......	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
No. Mankato, secondary....	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Outside, primary..........	1	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Outside, secondary.........	...	1	...	1	...	1	...	...	1	1	...	1	...	...	1	...	...	1	...	1	...	...	1	...	...	...	...	...	1	...	...	11
Total primary.............	7	2	1	...	2	...	...	1	...	1	...	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	16
Total secondary...........	...	1	...	3	...	3	1	1	2	2	3	2	1	1	2	1	2	1	2	3	...	3	1	2	...	2	...	2	1	1	...	43
Grand total...........	7	3	1	3	2	3	1	2	2	3	3	3	1	1	2	2	2	1	2	3	...	3	1	2	...	2	...	2	1	1	...	59

APPENDIX—TABLE No. 1—Continued
All Cases Belonging to Mankato Outbreak

SEPTEMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		To-tal
Mankato, male, secondary...	...	1	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	5
Mankato, female, secondary.	1	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	3
Outside, male. secondary....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1
Outside, female, secondary..	...	...	...	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	...	...	4
Mankato, secondary........	1	1	1	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	1	...	1	...	8
Outside, secondary.........	...	...	...	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	1	...	5
Grand total...........	1	1	1	...	...	2	...	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	1	...	1	1	...	2	....	13

OCTOBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	To-tal
Mankato, male, secondary...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	3
Mankato, female, secondary.	1	...	...	1	...	1	...	...	...	...	...	...	...	1	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6
Outside, male, secondary...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Outside, female, secondary..	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Mankato, secondary........	1	...	...	2	1	1	...	...	...	...	...	...	...	1	1	...	1	...	...	...	...	...	...	1	...	...	...	...	...	...	...	9
Outside, secondary.........	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Total.:...............	1	...	...	3	2	1	...	...	...	...	...	...	...	1	1	...	1	...	...	...	...	...	...	1	...	...	...	...	...	...	...	11

Cases omitted with reasons—

Male, primary, 133, Mankato, date not given (July).
Male, primary, 262, Mankato, date not given (July).
Male, primary, 134, Mankato, date not given (July).
Male, secondary, 322, Mankato, date not given.
Male, primary, 51, outside, date not given (July). No evidence, probably sick in Mankato.
Male, primary, 69, Outside, date not given (July).
Female, primary, 398, Mankato, date not given, July early.

	Total Cases Listed	Primary	Secondary	Male	Female
June....................	4	4	....	....	4
July....................	417	414	3	186	231
August..................	59	16	43	19	40
September...............	13	....	13	6	7
October.................	11	....	11	4	7
Total..................	504	434	70	215	289

TABLE No. 2

Age and Sex of Patients—Mankato Outbreak

MALE

AGE	North Mankato Total	Outside Total	Mankato Total	Males Total	Females	Female Excess	Excess Made Up Thus: North Mankato	Excess Made Up Thus: Outside	Excess Made Up Thus: Mankato
Under 1	....	....	....	....	....	....	....	....	....
1- 4	....	1	6	7	4	—3	....	....	....
5- 9	1	....	19	20	21	+1	....	....	....
10-14	....	4	39	43	41	—2	....	....	....
15-19	1	5	36	42	72	+30	+1	+13	+16
20-24	3	8	20	31	61	+30	+2	+7	+21
25-29	2	4	14	20	26	+6	—2	+4	+ 4
30-34	2	4	10	16	28	+12	—2	—2	+16
35-39	3	3	8	14	11	—3	....	....	....
40-44	....	1	11	12	11	—1	....	....	....
45-49	....	1	4	5	4	—1	....	....	....
50-54	....	....	5	5	5	....	....	....	....
55-59	....	....	2	2	3	+1	....	....	....
60-64	....	....	....	....	1	+1	....	....	....
65-69	....	....	1	1	....	—1	....	....	....
	12	31 *2	175 *1	218 3	....				
		33	176	221					

FEMALE

AGE	North Mankato Total	Outside Total	Mankato Total	Females Total					
Under 1	....	....	....	....	....	....	....	....	....
1- 4	....	....	4	4	....	....	....	....	....
5- 9	....	....	21	21	....	....	....	....	....
10-14	2	4	35	41	....	....	....	....	....
15-19	2	18	52	72	....	....	....	....	....
20-24	5	15	41	61	....	....	....	....	....
25-29	....	8	18	26	....	....	....	....	....
30-34	....	2	26	28	....	....	....	....	....
35-39	....	1	10	11	....	....	....	....	....
40-44	....	1	10	11	....	....	....	....	....
45-49	....	1	3	4	....	....	....	....	....
50-54	1	....	4	5	....	....	....	....	....
55-59	....	1	2	3	....	....	....	....	....
60-64	....	....	1	1	....	....	....	....	....
65-69	....	....	....	....	....	....	....	....	....
	10	51	227 2	288 2					
			229	290					

*Ages not given. Male (51 outside) "boy;" male (69 outside) "adult;" male (133 Mankato) "boy;" female (398 Mankato) "young;" female (248 Mankato) "adult."

COMMENTS ON DIAGRAM (1).

Total cases occurring in Mankato (excluding North Mankato) and outside by age and sex.

Males, continuous line. Females, interrupted. Age distribution of general population, dotted line.

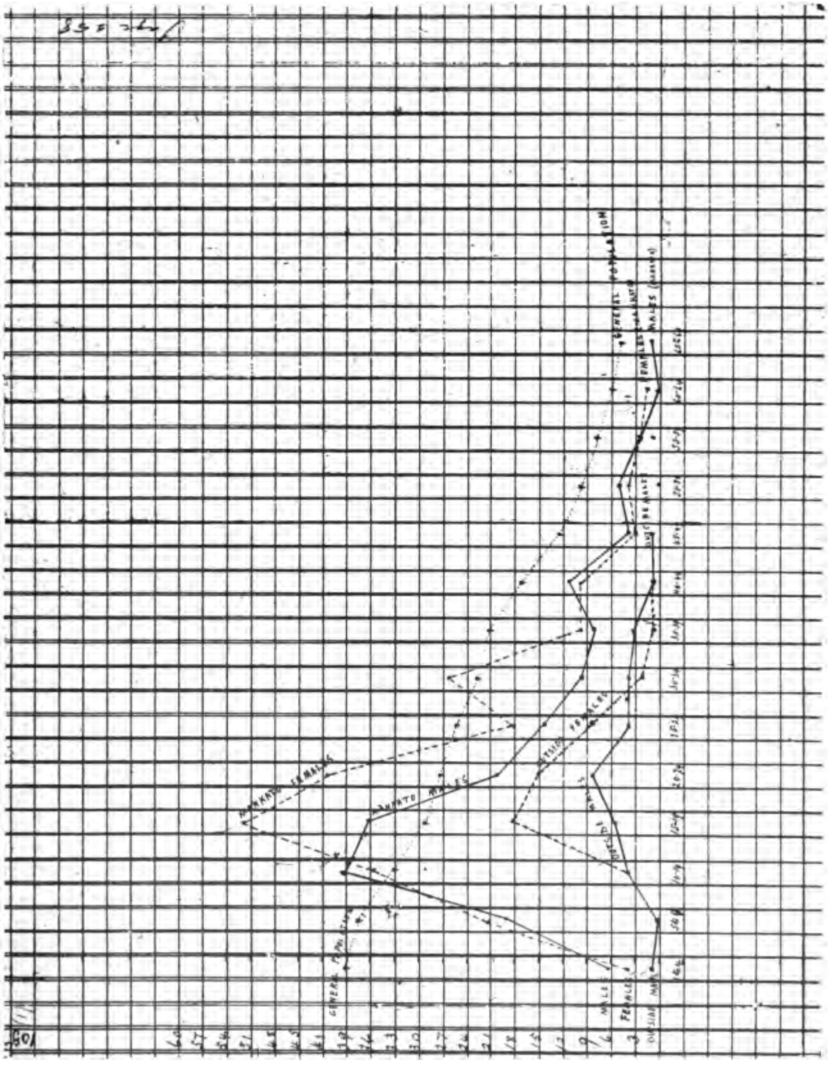
Mankato males listed, 175. Females listed, 227. Total, 402. (Three cases, 1 male, 2 females, ages not given.)

Outside males listed, 31. Females listed, 51. Total, 82. (Two cases, (males) ages not given.)

In Mankato, female patients exceeded male patients at ages 15 to 24, and again at 30 to 34. Otherwise the parallelism is quite remarkable.

While the excess is partly accounted for by the excess of female secondaries, it is in part due to an excess of female primaries, probably to a variety of sociological reasons which gave to the general population of Mankato an excess female population. As a well-to-do manufacturing, business and scholastic center, females in many capacities were engaged as office girls, clerks, stenographers, students, servants, etc.

The excess of outside females over outside males is wholly accounted for by the excess females amongst normal students and teachers, visitors and secondaries.



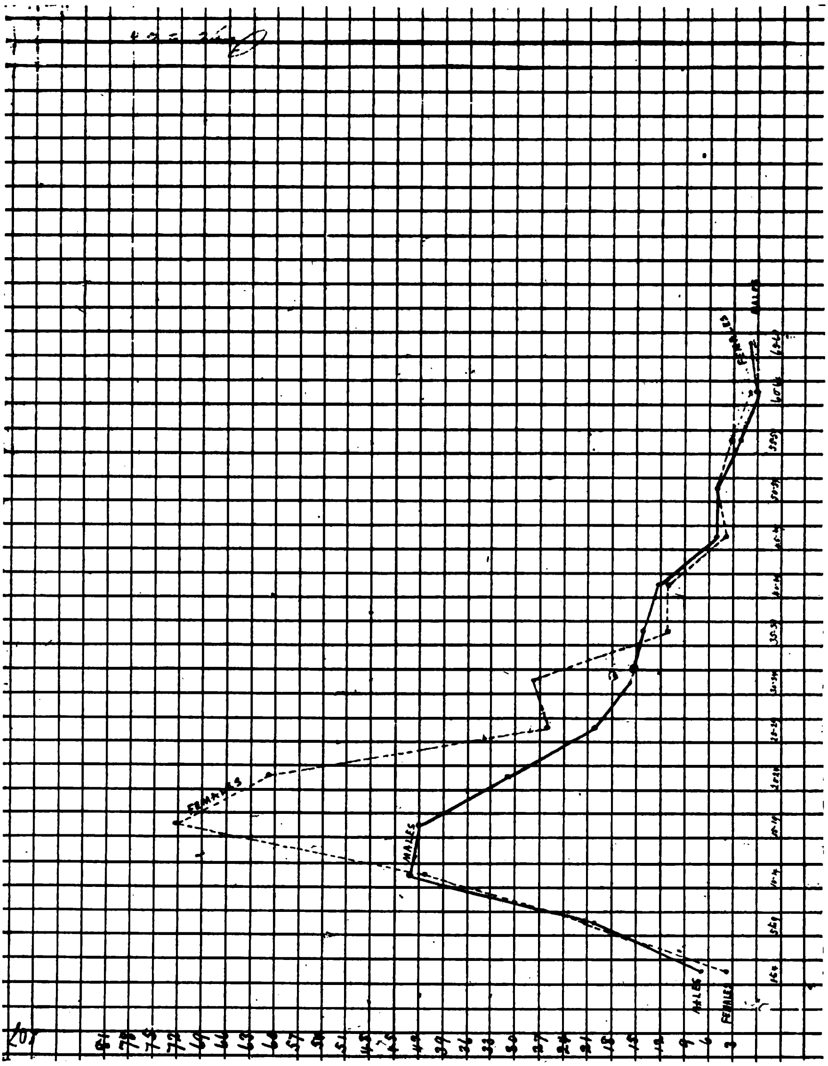
COMMENTS ON DIAGRAM (2.)

Total cases due to Mankato infection (Mankato, North Mankato and outside) by age and sex.

Males, continuous line. Females, interrupted.

Males listed, 218. Females listed, 288. Total, 506. (Five cases, 3 males, 2 females, ages not given.)

The excess of females from 15 years to 34 years of age is due in part to an excess of females exposed to the infection, as visitors, normal and other school students, domestics, etc., but also in part to the greater ex-



posure of females to secondary infection when acting as nurses to primary cases.

The statement that typhoid fever selects males rather than females where exposure is equal was evidently wholly untrue in this outbreak, the sexes being infected in proportion to their relative abundance.

TABLE No. 3

Occupations of Mankato Cases

Normal school students	9
Other students	84
Normal school teachers	4
Music teachers	2
Other teachers	7
"At home"—i. e. young children, young men and women not working, a few children of school age, not attending school, a few old people unfit for work, etc	82
Housewives	72
Nurses—hospital	6
Nurses—private	3
Domestics	5
Cooks—hotel	1
Cooks—cafe	1
Kitchen help, cafe	1
Waitress, lunchroom	1
Grocers	1
Bookkeeper	1
Clerk	13
Shipper	4
Baker	2
Candymakers	6
Laundry	6
Druggist	2
Milker	1
Bottle capper	1
Butcher	2
Steam fitter	1
Bookkeeper	3
Stenographer	4
Salesman	3
Collector	1
Laborers	11
Milliners	6
Tailor	1
Knitters	5
Paper hanger	1
Janitor	1
Janitress	1
Teamsters	4
Livery	1
Photographers	3
Gas fitter	1
Bankers	3
Cigar makers	2
Coopers	3
Carpenters	3
Bellboys	2
Barbers	2
Street railway	1
Furniture	1
Convent House	1
St. Josephs	1
Engineer	2
Real estate	2
Actress	1
Railroad man	2
Brick layer	1
Press room	1
Plumber	1
Preacher	1
Shoemaker	1
Physician	1
Merchant	1
Bookbinder	1
Lumberyard	1
Malster	1
Miller	1
Stone cutter	1
Life insurance	1
Not given	1

TABLE No. 4

Occupations of Outside Cases with Reasons for being in Mankato

Primaries—at Circus

Students	7
Housewives	3
Farmer	4
Teacher	2
Laborer	1
Buttermaker	1
	18

Visitors

Students	3
Housewives	7
Farmer	4
Teacher	2
Minister	3
Banker	1
Lumberman	1
Not given	2
	23

Temporary Business

Domestics	6
Clerk	1
Carpenter	1
	8

Studying in Mankato

Students, normal	8
Teachers	5
Other students	4
	17

Secondaries to Outside Cases

To housewives—	
Farmer	1
Students	3
To minister—	
Housewives	1
Students	3
To farmer—	
Housewives	2
To domestic—.	
Housewife	1
Sister	1
Brother	1
Husband	1

Secondaries to Cases in Mankato

To patient in Mankato.	
Nurse	1
Sec. to this nurse	1
To daughter in Mankato.	
Housewife	1
To brother in Mankato.	
Housewife	1
To unknown source.	
Student	1

TABLE No. 5

Occupations, No. Mankato Cases

Students	3	All drank water in Mankato at circus, carnival or party.
Laborers	3	All worked in Mankato
Clerks	3	All worked in Mankato
Carpenters	4	All worked in Mankato
Roofer	1	Worked in Mankato
Shipper & helper	2	All worked in Mankato
Knitter	2	All worked in Mankato
Cabinet maker	1	Worked in Mankato
Candy packer	1	Worked in Mankato

Secondaries

Housewife, nursing daughter	1
Housewife, no history	1

TABLE No. 6—MANKATO CASES
36 Secondaries—Females

	Mankato	North Mankato	Outside
July	2	1	1
August	25	1	6
September	3	....	4
October	6	....	1

No.	First Symptoms Date	Sex	Age	Occupation	Source	How Infected	Probable Date of Infection	Total in Family	Water	Exposure at Date of Infection to Previous Case
351M	July 27	F	14	Student	Sister, 7-5	Fam. contact	July 13	5	+	+
246	July 29	F	21	Servant	Patients in Hosp.	Contact	July 15	Hospital	—	+
279	Aug. 4	F	22	Nurse	Patients in hosp	Nursing	July 21	Hospital	—	+
370	Aug. 4	F	50	Housewife	Son 7-10	Nursing	July 21	8	—	+
21	Aug. 1-6	F	40	Housewife	....	....	July 16-23	2	—	....
382	Aug. 9	F	32	Housewife	Daughter	Nursing	July 26	10	—	+
253	Aug. 10	F	35	Nurse	Patient 7-15	Nursing	July 27	7	—	+
291	Aug. 11	F	12	Student	Father 7-3; brother 7-13	Fam. contact	July 28	7	—	+
292	Aug. 11	F	6	At home	Brother 7-13	Fam. contact	July 28	7	—	+
239	Aug. 11	F	28	At home	Cousins	Fam. contact	July 28	5	—	+
273	Aug. 12	F	33	Housewife	Son 7-9; daughter 7-9	Nurse	July 29	5	—	+
338	Aug. 14	F	57	Housewife	Son 7-16	Nursing	July 31	5	—	+
247	Aug. 15	F	29	Laundry	Patients clothes	Washing	Aug. 1	3	—	Clothing
282	Aug. 16	F	17	Nurse	Patients in hosp.	Nursing	Aug. 2	Hospital	—	+
106	Aug. 17	F	19	Housework	Neighbors	Flies	Aug. 3	6	—	Flies
371	Aug. 17	F	35	Housewife	Patient 8-10	Fam. contact	Aug. 3	6	—	+
58	Aug. 19	F	29	Nurse	Patient 7-17	Nursing	Aug. 5	4	—	+
14	Aug. 19	F	7	Student	Walking case	Fam. contact	Aug. 5	7	—	+
149	Aug. 20	F	17	Housework	Walking case	Fam. contact	Aug. 6	2	—	+
155	Aug. 20	F	19	Laundress	Patients clothes	Washing	Aug. 6	6	—	Clothing
372	Aug. 22	F	17	Student	Bro. 7-10; moth-8-12; father 8-7	Fam. contact	Aug. 8	6	—	+
275	Aug. 22	F	7	Student	Mother 7-8	Fam. contact	Aug. 8	5	—	+
274	Aug. 22	F	3	At home	Mother 7-9	Fam. contact	Aug. 8	5	—	+
375	Aug. 26	F	22	Knitter at mill	Sister 7-16	Fam. contact	Aug. 12	5	—	+
329	Aug. 28	F	5	At home	Brothers 7-17	Fam. contact	Aug. 14	6	—	+
311	Aug. 28	F	7	Student	Brother 7-1	Fam. contact	Aug. 14	8	—	+
15	Aug. 30	F	17	Student	....	....	Aug. 16	5	—	+
383	Sept. 1	F	13	Student	Sister 7-12	Fam. contact	Aug. 16	9	—	+
248	Sept. 12	F	Adult	Laundress	Daughter 8-15	Nursing	Aug. 29	3	—	Flies
212	Sept. 24	F	15	Student	Neighbors	Fam. contact	Sept. 10	6	—	+
131	Oct. 1	F	10	Student	....	....	Sept. 17	5	—	Flies
345	Oct. 4	F	10	Student	Sister 7-12; 9-1	Fam. contact	Sept. 22	10	—	+
179	Oct. 6	F	32	Housewife	....	....	Sept. 22	6	—	+
346	Oct. 14	F	8	Sister 7-12;sis-9-1; bro. 9-6.	Student	Fam. contact	Sept. 30	10	—	+
281	Oct. 15	F	23	Nurse	Pats. in hosp.	Nursing	Oct. 1	Hospital	—	+
402	Oct. 17	F	44	Housewife	Son 7-16	Nursing	Oct. 3	4	—	+

TABLE No. 6—Continued—NORTH MANKATO SECONDARY FEMALES

July, 1; August, 1.

No.	Fisrt Symptoms Date	Sex	Age	Occupation	Source	How Infected	Probable Date of Infection	Total in Family	Water	Exposure at Date of Infection to Previous Case	Probability
22	July 31	F	53	Housewife....	Daughter 7-10..	Nursing......	July 17	9	—	+	ps. secondary
19	Aug. 13	F	19	Housewife....	....	....	July 31	3	—	+	ps. secondary

OUTSIDE

No.	First Symptoms Date	Sex	Age	Occupation	Source	How Infected	Probable Date of Infection	Total in Family	Water	Exposure at Date of Infection to Previous Case	Sick at
14	Aug. 4	F	55	Housewife..	Mankato, daugh. 7-2.	Visiting....	July 21	3	—	+	St. Claire
43	Aug. 9	F	23	Housewife..	Man. husband 7-16..	Nursing....	July 26	8	—	+	White, S.D.
35	Aug. 10	F	10	Student....	Man. bro.-in-law 7-16	Fam. cont..	July 27	8	—	+	White, S.D.
47	Aug. 15	F	31	Nurse......	Man. pat. Lipp 7-12..	Nursing....	Aug. 1	11	—	+	Goo Thunder, Minn.
48	Aug. 20	F	29	Housewife..	Man. brother 7-10...	Visiting....	Aug. 6	5	—	+	Willmar
37	Aug. 29	F	48	Housewife..	Daugh. in St. Claire, 7-12............	Nursing....	Aug.15	8	—	+	St. Clair
45	Sept. 6	F	15	Student....	Mankato 9-1........	....	Aug.25	5	—	+	Rapidan Mills
50	Sept. 8	F	23	Housewife..	Bro. 7-17, Garden City	Visit.......	Aug. 27	7	—	+	Gd.Thunder
46	Sept. 25	F	24	Nurse......	Pat. 7-15 Gd. Thund.	Nurse......	Sept. 11	11	—	+	"
40	Sept. 27	F	15	Student....	Sis. 7-24, Gd.Thunder	Fam. cont..	Sept. 13	8	—	+	"
42	Oct. 5	F	11	Student....	Sis. 7-24, Gd.Thunder.	Fam. cont..	Sept. 21	8	—	+	"

TABLE No. 7—MANKATO MALE SECONDARIES

No.	First Symptoms Date	Sex	Age	Occupation	Source	How Infected	Probable Date of Infection	Total in Family	Water	Exposure at Date of Infection to Previous Case
349	Aug. 6	M	6	At home	Brother 7-6	Fam. contact.	July 23	8	—	+
320	Aug. 7	M	42	Teamster	Son 7-9	Nursing	July 24	5	—	+
381	Aug. 8	M	4	At home	Sister 7-12	Fam. contact.	July 25	10	—	+
330	Aug. 24	M	3	At home	Brother 7-17	Fam. contact.	Aug. 10	6	—	+
53	Aug. 24	M	3	At home	Walk.case,father	....	Aug. 10	4	—	+
71	Aug. 26	M	55	Shoemaker	Son	Fam. contact.	Aug. 12	3	—	+
394	Sept. 2	M	11	Student	Sister 7-18	Fam. contact.	Aug. 19	8	—	+
395	Sept. 3	M	41	Furniture	Daughter 7-18	Fam. contact.	Aug. 20	8	—	+
384	Sept. 6	M	12	Student	Sister 7-12	Fam. contact.	Aug. 23	11	—	+
30	Sept. 28	M	8	Student	....	....	Sept. 14	5	—	+
48	Sept. 30	M	15	Student	....	....	Sept. 16	3	—	+
180	Oct. 5	M	32	....	....	....	Sept. 21	3	—	+
220	Oct. 4	M	22	Laborer	....	....	Sept. 20	3	—	+
401	Oct. 24	M	9	Student	Brother 7-16	Fam. contact.	Oct. 10	6	—	+
322	....	M	30	Laborer	Daughters, 7-28 7-21	Nursing	....	5	—	+

OUTSIDE MALE SECONDARIES

No.	First Symptoms Date	Sex	Age	Occupation	Source	How Infected	Probable Date of Infection	Total in Family	Water	Exposure at Date of Infection to Previous Case	Sick At
36	Aug. 2	M	15	Student	Brother-in-law 7-16	Fam. cont.	July 19	8	—	+	White, S. D.
84	Aug. 6	M	13	Student	Brother-in-law 7-16	Fam. cont.	July 23	8	—	+	White, S. D.
38	Aug. 12	M	3	At home	Man. sist. home 7-12	Fam. cont.	July 29	8	—	+	St.Clair,Mn.
13	Aug. 18	M	38	Laborer	Man. wife in hsp.7-18	Visiting	Aug. 4	5	—	+	near Mank.
44	Aug. 23	M	29	Well-digger.	Sister, 7-9	Fam. cont.	Aug. 9	5	—	+	Janesville
39	Sept. 29	M	13	Student	Sister 7-24	Fam. cont.	Sept. 15	8	—	+	Gd. Thunder
41	Oct. 4	M	21	Farmer	Sister 7-24	Fam. cont.	Sept. 20	8	—	+	Gd. Thunder

TABLE No. 8

Outside Places Involved in Mankato Outbreak—Primaries and Secondaries

Amboy	1	(farm near) 1
Austin	1	
Bricelyn	1	
Columbus, N. D.	1	
Cambria	1	
Decorah	1	
Eagle Lake	1	
Easton	1	
Fairfax	1	
Good Thunder		(farm near) 10
Holloway	1	
Janesville		(farm near) 6
Judson		(farm near) 2
Kasota	1	(farm near) 3
Le Sueur		(farm near) 1
Lake Crystal	1	
Morgan	2	
Mankato		(farm near) 4
Mapleton		(farm near) 2
Nicollet		(farm near) 1
New Ulm	2	
Ottawa	2	
Owatonna	2	
Redwood Falls	1	
Ryder, N. D	1	
Rapidan		(farm near) 4
St. Clair		(farm near) 6
St. Peter	3	
South Bend		(farm near) 1
Seattle, Wash	1	
Springfield	1	(farm near) 1
Staples	1	
Towner, N. D	1	
Truman	1	
Vernon Center		(farm near) 1
Waterville	3	
Wells	1	
Winona	2	
White, S. D	5	
Willmar	1	

Cases sick in Mankato	Cedilla, Mich	1
	Biglow	1
	Minneapolis	1
	Jackson	1
	New Richland	1
	New Prague	1
	Manson, Iowa	1

47 places, excluding Mankato and No. Mankato
91 cases

TABLE No. 9

Outside Places Showing Secondaries (18)

One near Rapidan possibly extraneous case.
(Note—1 case was a secondary from Mankato and infected a further case at home.)

Janesville	1	Infected by sisters, primaries from Mankato.
White, S. D.	4	Infected by brother-in law, a primary from Mankato.
Good Thunder	4	Infected by sister, a primary from Mankato.
Good Thunder	2	Infected by sister, a secondary from Mankato.
Rapidan	1	Infected by brother, a primary from Mankato.
St. Clair	2	Infected by sister, a primary from Mankato.
St. Clair	1	Infected by daughter, a primary from Mankato.
Near Mankato	1	Infected by wife, a primary from Mankato.
Willmar	1	Infected by brother, a primary from Mankato.

TABLE No. 10

Male Deaths

No.	Age	Occupation	First Symptom	Probable Infection	Primary or Secondary	Source	Died	Date
51°	....	....	....	....	Primary...	Water.....	New Ulm..	....
214m	2	Child.....	7–4	6–25	Primary...	Water.....	Mankato.	8–9
48m	15	Student...	9–30	9–16	Secondary.	....	Mankato..	10–21
295m	18	Delivery...	7–10	6–26	Primary...	Water.....	Mankato..	8–15
260m	21	Asst. Mgr.	7–1	6–25	Primary...	Water.....	Mankato..	7–20
220m	22	Laborer...	10–4	9–20	Secondary	....	Mankato..	....
3m	24	Student...	7–4	6–25	Primary...	Water.....	Mankato..	8–11
63°	26	Farmer....	7–15	7–1	Primary...	Water.....	Vernon Center..	....
117m	28	Engineer..	7–13	6–29	Primary...	Water.....	Mankato..	8–1
91m	30	Laborer...	7–8	6–26	Primary...	Water.....	Mankato..	7–21
163m	32	Ship.Cl'rk.	7–14	6–30	Primary...	Water.....	Mankato..	7–31
185m	33	Banker....	7–10	6–26	Primary...	Water.....	Mankato..	7–31
289m	35	Shipper...	7–3	6–25	Primary...	Water.....	Mankato..	8–7
219m	37	Traveller..	7–7	6–25	Primary...	Water.....	Mankaot..	....
40m	40	Bookkeep'r	7–12	6–28	Primary...	Water.....	Mankato..	8–1
107m	44	Salesman..	....	6–26	Primary...	Water.....	Mankato..	8–2

TABLE No. 11

Female Deaths

No.	Age	Occupation	First Symptom	Probable Infection	Primary or Secondary	Source	Died	Date
350m	7	Child.....	7–5	6–25	Primary...	Water.....	Mankato..	7–14
351m	14	Student...	7–26	7–12	Primary...	Water.....	Mankato..	8–12
57m	16	Student...	7–12	6–28	Primary...	Water.....	Mankato..	7–24
120m	17	Hsewk....	7–16	7–2	Primary...	Water.....	Mankato..	....
280m	18	Nurse.....	8–1	7–18	Secondary.	Patients...	Mankato..	10–16
230m	19	Student...	7–9	6–25	Primary...	Water.....	Mankato..	7–29
183m	19	Milliner...	7–6	6–25	Primary...	Water.....	Mankato..	7–20
26°	21	Servant...	7–9	6–25	Primary...	Water.....	Janesville..	....
228m	21	Student	7–11	6–27	Primary...	Water.....	Mankato..	8–11
23°	22	Student...	7–18	7–4	Primary...	Water.....	Janesville..	....
29°	22	Teacher...	7–7	6–25	Primary...	Water.....	Bricelyn...	....
176m	23	Hswf......	7–7	6–25	Primary...	Water.....	Mankato..	8–14
156m	28	Hswf......	8–12	7–29	Primary...	Water.....	Mankato..	9–7
47°	31	Nurse.....	8–15	8–1	Secondary.	Patient....	Good Thunder	....
253m	34	Hswf......	7–13	6–29	Primary...	Water.....	Mankato..	10–19
316m	43	Dressmak'r	7–14	6–30	Primary...	Water.....	Mankato..	8–8
88m	44	Hswf......	7–10	6–26	Primary...	Water.....	Mankato...	....
325m	46	Hswf......	7–10	6–26	Primary...	Water.....	Mankato..	7–25
327	50	Hswf......	9–28	9–14	Secondary.	Daughter..	Mankato..	....

INVESTIGATION AND CONTROL OF TYPHOID FEVER AT BAUDETTE AND SPOONER.

Destroyed by Forest Fires Oct. 7, 1910.

Newspaper notices of the destruction of these towns and of the existence of great numbers of typhoid fever cases amongst the refugees led to the commissioning of the director of the division of epidemiology by the State Board of Health to visit Baudette and Spooner and take such emergency public health measures as might be found necessary. Since it was foreseen that a representative of the Board would be needed for an indefinite period to supervise sanitation, and especially to segregate and care for the typhoid cases, Dr. G. D. Haggard accompanied the director.

The reports stated that International Falls was full of refugee typhoids, and was therefore first visited and investigated. This report was found almost wholly in error, but the investigation resulted in recommendations relating to such typhoid fever.

Reaching Baudette October 13, investigation was at once made of the sources of the existing typhoid and such as had existed, unreported, to an alarming extent, previous to the fire. Adjutant General Wood, in command of the National Guard, ordered out to the protection and relief of the survivors and refugees; Major T. C. Clark, in charge of the National Guard Medical Corps, and others who had arrived earlier furnished every information and facility for investigation and sanitary work. After the real situation was appreciated, the voluntary resignation of the health officers of Baudette and Spooner were secured, at the suggetsion of Attorney General Simpson, and the way thus made clear for the legal appointment of Dr. Haggard as special agent of the State Board of Health in charge of public health in the burned district, which was made at once by the director, under his authorization as representative of the State Board of Health.

Dr. Haggard's report follows, omitting the detailed statements of expenditures, supplies, etc.:

SPECIAL REPORT OF SANITATION HOSPITAL AND RELIEF WORK AT BAUDETTE AND SPOONER FOR OCTOBER AND NOVEMBER, 1910, RENDERED DECEMBER 10.

G. D. Haggard, M. D., Special Agent of State Board of Health.

Baudette and Spooner were new towns. They were lacking in the settled security of established homes, the necessary foundation for public spirit and concerted action. Their sole incomes were from license money. Many of the structures of the towns were flimsy; there were few good toilets; most of those in use were open to the prevailing clouds of flies. The water system was new, and not above reproach, and sewers were just begun.

Under these conditions, typhoid fever, largely from flies and contact, flourished unreported in Baudette, where a refractory health officer neglected and refused to inform the State Board of Health. It was thus that a typhoid epidemic involving about 5 per cent to 10 per cent of the population remained unreported until the fire drove the sick into towns that reported them.

Typhoid was present in 1908 and in 1909, but the 1910 summer season furnished a widespread and severe epidemic. Beginning in the early summer it made rapid spread from boarding houses, hotels, restaurants and homes. Help carried it to distant parts of the towns; guests to other towns; flies from door to door; milk sales were made from typhoid houses, and to our inquiries the people replied that "it was in almost every other house."

Along the river slopes were many shallow wells, some of which were directly below open privies; others at the foot of slopes that carried off the wastes from the houses. The sluggish Baudette river, polluted from either shore, carried its receipts along the banks and to the wharves of Old Baudette where water for many households was daily dipped. At the point of land between the rivers—Baudette and Rainy—a large mill privy overhung the river at the neutral point of flow, above the water intake of Baudette. The exceeding dryness of the season alone prevented serious contamination of the wells from direct surface water washing into them.

Old Baudette was that part of town disposed as a squatter town, consisting of two stores, a hotel, power house, depot and fifty-three small houses and shacks, all of which were north of the fire line and escaped destruction.

On October 7th the fire scattered about three-fourths of the population of nearly 1,200, thus carrying to Rainy River, Barwick, Winnipeg, International Falls and Duluth some of the sick and infected. About 500 persons remained in tents, bunk-house, feeding-house, mill office and engine room of Spooner, and at relief camp, depot, power house and homes of Baudette. Into these places they were crowded closely with insufficient clothing, little covering and scant food until relief came. Among these, twenty-six cases of typhoid were found.

On the 12th and 13th of October Dr. T. C. Clark, of the Minnesota National Guard, collected five cases of typhoid, and with one burned person started the first hospital work. The number was ten on the 16th.

Having made observations in matters of sanitation and typhoid with Dr. H. W. Hill and Dr. G. F. Swinnerton, at International Falls, I reached Baudette early on the 14th of October. In company with Drs. Hill and Clark I made full house to house inspection of houses, wells, outhouses, etc., in the burned district and attended a conference of the relief forces. In the afternoon, with a detail of guards and impressed laborers I filled six wells, disabled four pumps, called at every house, obtaining a sick list, and giving out supplies of lime chloride with instructions for use; treated every privy with lime, and removed the mill privy from over the river. On the 17th all the liming was repeated. After the 18th little was to be feared from the flies by reason of the frost. Each morning and evening I secured from the camp gangs of laborers for excavations. Three large pits were dug in Spooner, over which the mill company erected new and better outhouses. In Baudette we dug eleven smaller holes, over some of which we placed outhouses, thus removing them farther from the dwellings, and over six we later erected model outhouses. Excavation was also made for the hydrant that should replace the destroyed wells and supply Old Baudette with treated water.

During this time Drs. Hill and Clark had cleared the floor of the Hylands store building, and on the 17th it was occupied by sixteen patients and turned over to me as the hospital. The main floor was 32 feet by 75 feet. The furnace was reached by outside entry under the sidewalk from the river bank. Three rooms above were reached by an outside stairway. The building was built at three periods and was only a shell.

While overseeing much outside work we made sick calls and prescribed for out patients, beside treating the sick in the hospital, making the building ready for our work and outfitting its interior. A sanitary closet was built for treatment of the infected discharges; the furnace was rehabilitated; stoves were installed in kitchen, laundry and nurses' quarters; fuel was obtained from driftwood on the river bank and from passing engines; the cots were raised to the height of beds; stairs were put through the floor to the furnace room, and through the roof to the nurses' quarters above; the kitchen and a small ward were partitioned off; tables were built in the kitchen and in the main ward; the roof was repaired and on the wash house it was relaid; water pipes were run two feet underground from 250 feet distant into hospital and drain pipes laid deeper to a distance of 100 feet; wooden sinks were made and placed in the wash house and main ward; clothes poles were set; a separatory drain was made for wastes; kitchen, housekeeping supplies and labor were secured from internal equipment; beds and bedding were added to daily. We had twenty-four patients by October 24th. For chairs we had boxes for five weeks, picked up as best we could.

Much of the labor until November was impressed, some was voluntary. Generally labor was very hard to get. The housekeeping and laundry work at first fell to the nurses. Later it still fell partly to them in addition to much of the cooking and a full program of nursing. A laundress was employed after first two weeks, and a janitor after November 6th. Kitchen help was irregular and insufficient. The personal care of the sick was well and faithfully done. The nurses were versatile, capable and determined. They merged everything in the care of the sick. Visiting Nurses Dolan and Karlsteen were especially well fitted to meet the difficulties. They were well seconded by the Misses Lagerman and Morrison. Nurses had no time off in several weeks.

Two nurses arriving on the 18th were unwilling to bear an "even hand" and complained of lack of system and errors of management. We were under most unusual conditions with everything to be hammered into shape while we served many sick. All this should have appealed very strongly to them as it did to the other nurses. They were promptly released.

The order of work in the hospital was that usual in the better hospitals.

The order of work for myself, after a week of outfitting, was as follows: Rising at 5:30 a. m., care of fires in kitchen, wash house and nurses' quarters; wood supply noted and some prepared; wastes of kitchen, private latrine and the sanitary closets removed; tubs relimed; personal toilet made; all patients and charts reviewed; treatment and diets ordered; out patients dressed and prescribed for; breakfast; ordering supplies for kitchen and house; dressing of surgical cases; calling at camps; prescribing for out patients; luncheon; directing construction of hydrant; further house to house canvass on typhoids; supper; bookkeeping and clinical records. Out patients appeared at all hours; they were referred to the military camp so long as a doctor was there. Later they came to me. Patients who could pay I referred always to the local physicians. In four instances this was impossible, and I treated them. One private patient was kept in the hospital, paid her board, and cash was acknowledged in my accounting.

Treatment afforded out patients, of which there was an average of seven daily, included seven phlegmons, four impetigo infections of superficial wounds, one gunshot wound of foot, one ax cut of leg. Within the hospital we operated on strangulated hernia, amputated parts of burned feet, removed tubercular glands, incised carbuncles.

The hospital held an average of three cases not typhoid thus: Pneumonia, two; diphtheria, one; tuberculous glands, one; burned feet, two; strangulated hernia, one; boils, one; intestinal intoxication, one; homeless child, one.

In treating guardsmen we prescribed for colds, constipation, headaches, catarrhal fevers, five; diphtheria, one; gastritis, five; salmon poisoning, three(nine affected); and made one examination for reinlistment.

I made three round trips of twenty and twenty-four miles, two of them at night, and in care of typhoids.

By direct questioning I obtained on October 27th, from the ex-health officer of Baudette, report of six typhoid suspects, out of which three typhoids were found and entered in the hospital. Later, I again asked for reports and received five names, out of which so far no typhoids have been found. Dr. Corrigan reported two secondary typhoid cases, apparently infected from patients discharged from the hospital and well along in convalescence. These have occurred in spite of the careful instruction I have given to outgoing patients, or their caretakers, as to the means of avoiding infection. The hospital treated twenty-nine cases of typhoid with the usual percentage of severe cases and had no fatality. There were ten cases of other diseases which yielded one fatality, a case of hopeless pneumonia. A study of the previous outbreak of typhoid fever has given us knowledge of 134 cases of typhoid occurring from July 1st to December 1st, with a mortality of 5.3 per cent. A chart herewith shows the occurrence of 93 cases as to the week in which sickness began.

Data in fifty-four cases of typhoid indicate that fly infection is entitled to the first place. Food and milk are more strongly suspected than water. Spooner had a good water supply, and Baudette several doubtful ones. Rating population as 900 for the former, and 1,200 for the latter, cases were not heavily in favor of either town. I have noted twenty cases using good water and nineteen using doubtful water. Fly infection strongly indicated forty-seven; secondary cases in families, fourteen; mass infections in families, twenty-seven; undoubted secondaries, nineteen; "typhoid next door," thirty-six.

The hospital was closed December 1st. Closing had been planned for November 25th. Few further cases were then to be expected, and as a matter of fact few occurred. Moreover, the temporary emergency hospital was unfitted for really cold weather without extensive reconstruction. One of our patients was sent to St. Lukes hospital in Duluth at eight dollars per week, with two or three weeks to stay. One patient with pneumonia was lodged with a neighbor, Mr. Ward, as he seemed moribund. He died the following morning. He was left in care of a trained nurse and Dr. Corrigan. Terms were made with the undertaker and burial secured. Six convalescents were returned to their friends. One of these has since had a return of fever.

All cotton bedding, towels, etc., were washed, boiled and hung within the hospital. Woolens, cots and furniture were placed in open form and the hospital fumigated. Woolens were then washed and rinsed in strong antiseptic solutions. Goods and supplies were invoiced and the whole property turned over to the relief committee with a soldier in charge.

While the treatment and control of typhoid was reasonably successful, local conditions were not good. The morale of the towns, the refractory physician, and more markedly here than elsewhere the non-reporting of disease, conspired to make epidemics sure. This was the more certain when we knew that whole families were sick with typhoid without having any physician. A district state officer of health is needed who will keep close to the local men and know the conditions to the last item.

Each town to which any of the Baudette or Spooner cases went, was notified by me at once, so far as they could be traced.

At the conference of relief early in our work I was directed to form a committee in each town for promotion of sanitation. Accordingly I secured these and held their first meeting. Those for Spooner are Mr. Weeks, Sr., Mr. Malone, Dr. J. E. Corrigan and C. L. Isted. For Baudette, Messrs. Geo. Arnold, P. S. Nelson, John Lindsay and A. M. Fermenich.

Dr. Corrigan, who acted as my deputy health officer in both towns, has spent much time with me in my absence, treating the sick—both in and out of the hospital—and has daily looked over the camp, and has done all willingly and treated every one with great consideration. This, too, without suggestion of any return. I wish to recommend that the relief committee make to him some substantial acknowledgment of this service.

It is with great pleasure that I acknowledge the response to recommendations regarding the wages of nurses.

In retrospect of the work done it is to be acknowledged that two cases have occurred whose sickness arose in spite of our efforts and care. Still others are rumored but cannot be found.

I wish to acknowledge the heartiest support from all sanitary and relief agencies, the militia and the citizens; also to appreciation of those we served and the faithful service of our helpers.

State Board of Health

Division of Engineering Report

For Two Years Ending

August 1, 1910

Frederic Bass, *Director*

The Division of Engineering has existed officially since the April 1910 meeting of the Board. Previous to that time the status of this branch of work was somewhat indistinct. At present the director of the division is responsible to the executive officer for all engineering problems. The headquarters are in the Engineering Department at the University where office space, furniture, light, and heat are provided by the University. The Engineering Library located here is of great assistance in furnishing data and reference.

The principal work which has thus far been handled by the division concerns sanitation of municipalities especially questions of water-supply and sewerage. Refuse collection and disposal are also important. In the last two or three years the examination of school house plans has become an important part of the work, plans for all new schools in the state being submitted for approval to this division. The law also gives to the State Board of Health control over sanitary conditions, construction and equipment of all public institutions. (See Sec. 2131, art. 6.). Several hospital plans have been submitted to this division under this provision.

The following is a list of localities where problems have been considered.

Water Supply:

Bemidji
Brainerd
Breckenridge
Canby
Cloquet
Crookston
East Grand Forks
Ellsworth
Fulda
Gilbert
Grand Rapids
Hibbing
Luverne
Keewatin
Minnetonka
Mankato
Minneapolis
New Ulm
New Brighton
Pipestone
St. Paul
St. Peter
Tracy
Walker Sanatorium

Sewerage:

Ada
Albert Lea
Anoka
Anoka Asylum
Baudette
Bemidji
Canby
Fulda
Lake Vadnais
Long Prairie
Luverne
Minneapolis
New Prague
Pipestone
St. Paul
Sauk Rapids
Trout Creek
Walker Sanatorium
Warren
Washburn Home
Willmar

Schools:

Steele County
Millerville
Newfolden
West Valley
Sauk Rapids
Strandquist
Ely
Blackduck
Grafton
Cormorant
Waltham
Forest Lake
Dist. 85, Faribault county
Warman
Breckenridge
White Iron
Twin Valley
Motley
Cloquet
Oak Park
Spooner
Kellogg
Elba
Red Wing
Browerville
Dassel
Dist. 19, Redwood county
Osseo
Virginia
International Falls
Wadena
Verndale
Delhi
Walker
Pleasant Mounds
Ellendale
Austin
District 137
District 2
District 70
Cuyuna
Elysian
Koochiching county
Arlington
Georgetown
Bemidji
Pennock
Backus
Dist. 85, Winnebago county
Hallock
Dist. 113, Marshall county
Redwood Falls
Dist. 14, Becker county
Rose Creek
Kinney Location
Butterfield
Milroy
Kirkhaven
Partridge
Brooks
Georgeville
Amboy
Tintah
Browns Valley
McKinley
Deer Creek
West St. Paul
Elysian
Sandstone
Dist. 24, Waseca county
Dist. 54, Nobles county
Watkins
Maynard
Worthington
Ericsburg
Buffalo Lake
St. Cloud
Shenango Location
Hayfield
Blue Earth
District 133
District 42
Browns Valley
Centerville
Elbow Lake
Eitzen
Wayzata

During the latter part of 1909, after the increased appropriation of $2,500 per annum became available, the engineer made a recommendation that an assistant be employed. The request met with the approval of the Board, and Mr. J. A. Childs, of St. Paul, a graduate of the civil engineering course at the State University, was employed.

The experience accumulated from numerous sanitary inspections had made it certain that in many communities in the state there were defects existing in public water supplies and sewerage systems which although apparently uninportant, might under unusual conditions, cause severe epidemics resulting in heavy loss of life. The epidemic of 1908 in Mankato is a striking instance of such a combination; little or no typhoid had ever occurred in that city and suddenly an epidemic broke out that cost over 50 lives not only in Mankato but in other parts of the state. It was due to defective wells and sewers as the personal observation of the engineer of this Board and others proved. **It could easily have been prevented.** In order to prevent other such disasters, it was decided to make a systematic inspection of public water-supplies and sewer systems so far as possible. Mr. Childs commenced such an inspection visiting the following cities and villages:

Aitkin
Alexandria
Argyle
Bagley
Barnesville
Bemidji
Biwabik
Bovey
Brainerd
Buhl
Cass Lake
Chisholm
Cloquet
Coleraine
Crookston
Detroit
Ely

Eveleth
Fergus Falls
Fertile
Fosston
Frazee
Grand Rapids
Hallock
Walker
Halley
Hibbing
Long Prairie
Lake Park
Little Falls
Luverne
Monticello
Moorhead
Nashwauk

Pelican Rapids
Perham
Park Rapids
Proctor
Red Lake Falls
St. Cloud
St. Hilaire
Sauk Rapids
Scanlon
Staples
Thief River Falls
Twin Valley
Two Harbors
Tower

Virginia
Warren

Forms for reports on water works and sewerage systems were formulated, there are shown in appendix V.

In order that the nature of the information gained may be clearly understood, a summary of sanitary conditions relating to water supply and sewerage has been put in condensed form. It will be noticed that there are many defects which often can be remedied at trifling cost, but which continue simply because the possible results of their continuance is evident only to those who have witnessed disaster following like conditions elsewhere.

In other cases the defects are not of a simple nature and thorough investigation is necessary. With the funds at hand it has been seldom possible to go into detail in any one place. The results of investigation are presented as follows:

Aitkin: Population, about 2,000. Water supply pumped from Mud River. Supply open to contamination and of doubtful sanitary quality. Tubular well of recent construction for future supply.

Sewer system, of the combined type, discharges into Mississippi River.

Alexandria: Population, 3,200. Water supply from a dug well, 28 feet in depth by 8 feet in diameter. Soil is gravel. One privy within 100 feet and another within 150 feet of the well. This condition in gravel soil is a possible source of contamination and should not be allowed.

Separate sewerage system discharges into Lake Agnes. The house sewage being first treated by septic tank.

A problem in the disposal of creamery waste has been important here. Purification must be resorted to for prevention of nuisance.

Appleton: Population, 1,300. Water supply taken from dug well about 30 feet in depth, curbed with brick. New tubular well has recently been driven very close to the old one to a depth of about 180 feet, from which it is proposed to supply the city with water for domestic purposes. On two sides of this well, and not more than 100 feet away, is the main sewer of the town. The soil is largely sand and gravel. While the water from this well may be of good quality, there is always a danger of this becoming contaminated with sewage. A more isolated location could easily have been obtained.

A combined sewerage system discharges unpurified sewage into the Pomme de Terre River.

Aurora: Population, about 1,500. Water supply pumped from dug well, about 84 feet in depth and 8 feet square; at the bottom is a drift about 20 feet long. Pump is located on platform about 24 feet from the bottom of the well. Location of pump directly over the water supply is dangerous in that the water may easily be contaminated by the pump attendant.

There is a sanitary sewer system. Few connections as yet. Sewage discharged into small creek about one-half mile east of the town.

Bagley: Population, 600. Water supply from well points sunk in sand adjacent to the pumping station. A privy, 50 feet distant from these points and attached to pumping station should be made watertight, as there is no layer of clay to prevent polluted ground water from seeping into well.

Barnesville: Population, 1,300. Water supply from two 8-inch driven wells, depths being 63 feet and 43 feet. Sanitary surroundings good. Soil is of sand, gravel and clay mixed. For fire protection water may be pumped from the Willow River. A clean water storage tank, holding upwards of 200,000 gallons, should be constructed and the Willow River intake removed.

Combined sewer system discharges into Willow River about one-half mile below the town. Stated by city clerk, that about four miles below the city the stream disappeared from the surface and flowed as ground water. Few connections with sewerage system. On account of small volume of flow, sewage is not a nuisance.

Bemidji: Population, about 5,500. Water supply pumped from two artesian wells. One 8-inch well, 265 feet in depth, and one 10-inch well, 343 feet in depth. Surface sanitary surroundings poor, but construction of wells such as to exclude pollution.

Sanitary sewerage system, with about two miles of pipe, discharges into the Mississippi River as it enters Lake Bemidji. Septic tank now under construction.

Bovey: Population, about 1,000. Water supply raised by air lifts from two tubular wells, 110 feet in depth. Water flows into 60,000-gallon concrete storage reservoir from which it is pumped to a 65,000-gallon elevated tank. Sanitary surroundings and arrangement of reservoirs and piping are good.

Natural drainage is excellent. Sanitary sewer system discharging into Trout Lake. Septic tank used.

Brainerd: Population, about 9,000. Water supply from Mississippi River. Supply is polluted. Has been cause in recent years of considerable typhoid. In October, 1910, a hypochlorite disinfecting plant installed and operated continuously since by G. W. Jevne, a graduate of the engineering college, state university. Water supply now free from typhoid contamination.

Sewer system of combined type, discharging into small stream which empties into Mississippi River a short distance below water works intake.

Breckenridge: Population, 2,000. Water supply from the Ottertail River. Until recently water received no purification and was cause of much typhoid. Purification plant now constructed, consisting of settling tank and rapid sand filters. A disinfecting plant, to be used in connection with sand filter, has been recommended by the State Board of Health, as no filter plant without some disinfecting auxiliary can be relied upon to produce at all times an effluent free from pathogenic bacteria when they are present in the raw water as they are in this stream.

A sewerage system discharges into the Ottertail River. Piping is so arranged that water may be pumped into city mains without first being filtered. Such an arrangement has been responsible for severe typhoid outbreaks at Waterloo, Iowa, Butler, Pa., and elsewhere. Is dangerous and should be removed.

Buhl: Population, about 800. Water supply from dug well about 140 feet in depth. Concrete curb extends to a depth of about 70 feet from surface. Curbing in porous condition exposing well to surface water. A sewer is located in alley about 20 feet distant. This is a dangerous situation.

In case of fire, water may be pumped from creek which flows about 300 feet distant from the pumping station. This emergency intake should be removed and storage reservoir constructed, holding upwards of 150,000 gallons, from which pure water could be pumped in case of fire. The use of this emergency intake was the cause of an epidemic of typhoid in Buhl in the fall of 1905.

A sanitary sewer system, provided liberally with flush tanks, discharges into the creek above mentioned, below the fire intake.

Cass Lake: Population, about 1,200. Water supply pumped from well points driven into the sand from the bottom of a well pit in pumping station. Some of the sanitary surroundings are bad, but water probably of good sanitary quality on account of the filtering effect of the quicksand from which water is pumped.

The sewer system, covering only a portion of the town, discharges without purification into Pike Bay, an arm of Cass Lake.

Chisholm: Population, about 5,000. Water supply supplied from Monroe mine. This water, as it comes from the mine is very often highly colored, very turbid and polluted with pathogenic organisms. Filtered before it is pumped to the city. Filter plant installed in 1905 by the Pittsburg Filter Co. Consists of two units, of 500,000 gallons capacity per day, each. Before filtration water receives about three hours' sedimentation. Design excellent. Plant in charge of C. J. Sullivan, water works superintendent, who received special training from the State Board of Health to enable him to collect samples of the water and make bacteriological analyses, and who is thus enabled to know exactly the quality of the water which is being furnished to the city. However, even with the excellent superintendence which this plant receives, there is danger of an epidemic from this water, as no mechanical filter without some sterilizing agent can at all times be relied upon to produce an effluent free from pathogenic organisms when such are present in the untreated water.

A disinfecting plant should be installed. The cost not to exceed $500.00 and the operating expenses would not be over $1.00 per day.

For better fire protection a large storage reservoir for filtered water is now under construction.

Sanitary sewer system covers large portion of village. Small proportion of the houses connected. The outlet into Longyear Lake. Sewage purification plant, consisting of septic tank and contact beds, constructed 1906. Design poor, but followed in spite of State Board of Health's advice. Plant abandoned after short service. Sewage now discharged unpurified into lake. Sewer system should be more generally used and privies abandoned. Fly typhoid prevalent in late summer.

Cloquet: Population, about 7,000. Water supply from springs located on the shore of small lake one-half mile south of the city, which are surrounded and protected from contamination by concrete walls forming basin or reservoir, 76 feet by 107 feet by 7 to 14 feet deep. Water supplied to city by two electrically driven centrifugal pumps, power transmitted from city. This source excellent from a sanitary point of view, but in the city system is connected for added fire protection with fire protection mains in lumber yards, the water for which is supplied from the St. Louis River, a polluted stream. Valves exist between city and lumber yard systems but do not remove danger.

Cloquet should construct storage reservoir within the city and install fire pumps for its own fire protection. Connections between city system and lumber company system should be discontinued. Until this is done, Cloquet will be in danger of an epidemic from the river water which may in time of fire be pumped into the city mains.

Sewer system discharges into St. Louis River.

Coleraine: Population, about 1,000. Water supply from mine located north of the village, drifts from which supply is taken separated by partitions from working parts of the mine. Separate system of pumps and piping carry clean water to elevated pressure tank at surface. Both inspection and analysis indicate an excellent supply.

Coleraine provided with a combined sewer system, discharging into Trout Lake. Septic tanks used. Few connections as yet.

Crookston: Population, 8,000. Water supply mainly from three artesian wells. Auxiliary supply from Red Lake River above the town filtered inefficiently after passing through infiltration gallery which serves as a kind of settling basin. Filter ordinarily run about seven to ten hours per week, water being stored in large clean water basin, from which it is pumped at periods of maximum demand. Provision made for pumping directly from river without using filter or without even passing through clean water basin, this arrangement being for fire protection only. Present filter needs remodeling. Adequate sedimentation basin should be constructed with proper appliances for the administration of the chemicals. A disinfecting plant should be installed and operated in connection with filter to insure against passage of pathogenic bacteria into the mains.

Sewerage system of combined type comprising about 8 miles of sewers; discharges without purification into the Red Lake River. Since East Grand Forks, situated only 30 miles below the city of Crookston, is depending for its water supply solely upon the Red River, the sewage of Crookston should receive at least partial purification.

Detroit: Population, 3,200. Recent changes and extensions in water system. Water now taken from Detroit Lake, which is a very popular summer resort and located almost within the city. Its shores are lined with cottages, bath houses, wharves, docks, etc. Fishing, boating and bathing are freely allowed on and in its waters. The water works intake pipe is about 300 feet from the shore and in only 8 feet of water. With this very unsanitary condition of the source, the city should take immediate steps for purification of the water supply. Some kind of disinfection, such as hypochlorite treatment, should be used. Such a plant would cost, in this case, not over $400.00, with operating expenses not over 75c per day.

An excellent system of separate sewers recently constructed discharge into an arm of Lake St. Claire, a shallow lake just west of the city. The sanitary sewage is passed through a septic tank before discharging into the lake.

Ellsworth: Population, 5,000. Water supply was in April, 1910, taken from a dug well located at center of two intersecting streets. Access to well obtained through manhole, cover of which was not tight, allowing street washings and other filth to enter water supply. A change in location of well recommended by State Board of Health.

No sewerage system, but an extensive system of tile drainage exists. A very small additional expense would have built sanitary sewer system serving all the purposes of tile drain and taking care of house sewage as well.

Ely: Population, about 4,000. Water supply from Shagwa Lake about one-half mile distant. Pumping station located on the south shore of lake. One intake pipe from which water is ordinarily drawn, extends about 2,400 feet from shore. Water before going to city is passed through mechanical filters of "Jewell" type, installed 1903. Two filters have a rated capacity of 500,000 gallons per day, each. Filters operated a few hours only each day. Before filtration water passes through settling tank, capacity about 54,000 gallons, which is not of proper shape to give good results. Instead of being round with the water entering at the bottom and overflowing at the top as at present, it should be long and narrow. During a few months in the summer, filters are clogged after one-half hour's use and must be washed. This is the result of the imperfect sedimentation.

The sewer system consists of about two miles of sanitary sewers, discharging into a small creek flowing into Shagwa Lake. Sewage receives no treatment and the creek is badly polluted. Measures now being considered for improvement.

Some danger that the water supply might be contaminated. No mechanical filter can, without some form of disinfection, be depended upon to produce at all times an effluent free from pathogenic bacteria. City should install hypochlorite disinfecting plant to be operated in conjunction with the present filters.

There is an emergency fire intake extending about 500 feet into Shagwa Lake by which water may be by-passed to the city without being first purified. This intake has not yet been used; its existence, however, is a menace to the health and possibly the lives of the citizens and should be removed.

Eveleth: Population, about 6,000. Water supply pumped from St. Marys Lake, is about two and one-half miles in length by three-fourths of a mile wide. Shores controlled by city. No bathing, fishing or boating allowed on and in its waters. No campers allowed upon the shores where any pollution may reach the water. Under these conditions the water supply of Eveleth is probably safe.

Sewer system of the sanitary type and with but few connections; discharges unpurified into ditch carrying small stream of water pumped from a mine. Lack of use of sewer system and use of privies largely responsible for typhoid in late summer and fall.

Fergus Falls: Population, 7,500. Water supply from the Ottertail River. Intake and pumping station located on bank of river about a mile above city. This river, before reaching Fergus Falls, flows through Frazee and near Perham. Between Fergus Falls and these two towns, are two lakes through which the river flows. Time of flow from Frazee to Fergus Falls possibly enough to insure removal of contamination from these places. However, this river is subject to contamination at many points. A disinfection plant has been recommended by the State Board of Health. First cost would be about $500.00, operating cost not over $1.00 per day. This would insure a perfectly safe supply.

Combined sewerage system discharges through three outlets into Ottertail River. Recent destruction of a dam has left the outlets above water level and sewage trickles over flats before reaching water. Outlets should be submerged. Breckenridge, located 30 miles below on this river is dependent on this river for its supply of water. Sewage of Fergus Falls should probably receive partial purification.

Fertile: Population, 800. Has two wells, one dug and one drilled. Dug well subject to contamination from outhouses and should be made tight.

No sewer system.

Fosston: Population, 1,000. Water supply from loosely curbed dug well. Several privies from 75 to 90 feet away. Clay stratum 15 feet from the surface, which is of no protection in preventing polluted ground water from seeping into a well of this character.

No sewerage system.

Frazee: No water or sewer system. A good water system would be an excellent improvement, but not put in on account of feeling of uncertainty as to future of village.

Grand Rapids: Population, about 2,500. Water supply from Hale Lake, which lies just north of the city. No control over the sanitary surroundings of this lake. Bathing, boating and fishing freely permitted. A creek, the outlet of Crystal Lake, discharges into Hale Lake about a third of a mile from the water works instake. Sanitary surroundings of creek very bad. Samples taken from it March 24, 1910, showed presence of fecal contamination. Either this creek should be diverted so as to discharge directly into the Mississippi, which could be easily done, and in addition the shores of the lake controlled so as to prevent all boating, bathing, fishing, etc., or the water should be purified.

A disinfecting plant, costing not over $300.00 to build and 50 cents per day to operate, would be sufficient to insure a pure water supply.

Sewerage system of combined type discharges without purification into the Mississippi River.

Hallock: Population, 1,400. Water supply from Two Rivers above sewer outlet, a wooden dam forming an impounding reservoir from which water is pumped. Stated by the health officer that the water under the ice in the reservoir became very stagnant. Sewer system empties into the Two Rivers. Septic tank in use.

Hibbing: Population, 6,000. Water supply described in Appendix III of this report.

Sewer system is of combined type. Sewage at present discharged without purification into creek which carries small amount of mine water. This creek afterwards flows through a location, the people in which are complaining of the nuisance from offensive odors. Plans for a sewage purification plant, consisting of a settling tank and percolating filter, have been drawn. The construction of this plant will begin shortly.

This plant will be one of the first built in the United States and the first in Minnesota using the hydrolytic principle of sedimentation, and this plant will mark a new step in the progress of sewage purification in this state.

Lake City: Population, 3,000. Water supply from dug well, 30 feet in depth by 12 feet in diameter, curbed with brick and located about 200 feet from shore of Lake Pepin. Soil is sand and gravel. Several well points have been driven from the bottom of the lake into the sand to increase the yield. An emergency intake by which water may be pumped from Lake Pepin is provided for extra fire protection. In the summer of 1910 the water in the city well became very low. The water works superintendent, in order to ascertain whether the intake was open or not, on July 2, 1910, pumped Lake Pepin water into the mains for a period of not more than ten minutes. The health officer was not notified of this fact, and knew nothing of the occurrence until he happened to hear about it accidentally nearly a week later, when he immediately notified the State Board of Health. In the meantime citizens had been in danger. Very fortunately no epidemic resulted.

The city should construct a clean water storage reservoir holding upwards of 250,000 gallons for fire protection purposes. Also the supply should be augumented by additional wells. The emergency intake should be destroyed as its existence is a menace to lives of citizens.

A sewerage system discharges unpurified sewage into Lake Pepin about one-fourth mile below water works.

Lake Park: Population, 800. Water supply from driven well, 370 feet in depth, the sanitary surroundings of which are good.

No sewer system.

Little Falls: Population, about 3,000. Water supply from Mississippi River. Water works system owned by private corporation. Section 8 of the water works company's franchise reads:

"The said William Fuller and S. Stahl shall furnish good, pure, wholesome water free from sediment to private consumers."

The Mississippi River water at Little Falls is not pure and wholesome since it receives the sewage from Aitkin, Brainerd and other towns above. A purification plant should be installed. Surface wells are used widely for drinking water. These are liable to occasional pollution, more serious as time goes on.

Sewerage system is of sanitary type comprising about three miles of sewers. Sewage discharged upon flats of the Mississippi River. This fact is the cause of some local complaint, and is a menace on account of danger of fly typhoid. Outlet should be carried to main channel of river and sewage discharged beneath surface. Could be done at small cost.

Long Prairie: Population, 1,500. Water supply from two dug wells, one 12 feet in diameter by 18 feet in depth, the other 24 feet in diameter by 20 feet in depth. Sandy soil. One privy within 75 feet of wells and cesspool 2,000 feet away. A large cesspool for court house is only 400 feet distant from the wells. Wells frequently pumped dry, showing that the drainage from the near neighborhood is toward the wells at these times. If well water is to be used as the source of supply for Long Prairie, a more isolated location for the wells should be chosen. A recently constructed sanitary sewerage system discharges into the Long Prairie River after being passed through a septic tank. A less expensive and more efficient settling tank was recommended by the State Board of Health. Septic tank was constructed contrary to the advice of the State Board of Health.

Luverne: Population 2,500. Water supply from two dug wells one 19 feet in depth by 13 feet in diameter, the other 21 feet in depth by 20 feet in diameter. These wells have been flooded in the past by water from Rock river. The State Board of Health recommended the curbing of one of the wells be raised 4 feet to the same elevation as the curbing of the other well in order to bring the top of curbing of both wells above the highest known level of the Rock river. Cost of this additional safeguard to the city would not be more than $100.00. In April, 1910, this recommendation had not been carried out, and Luverne still is exposed to a possible contamination of its water supply.

Sewerage system of the sanitary type discharges unpurified sewage into the Rock river.

Monticello: Population about 1,000. Water supply pumped from an 8-inch drilled well 238 feet in depth. Construction of well is such that contamination is excluded.

Partial sewer system of combined type discharges into the Mississippi river without purification.

Moorhead: Population, 5,500. Water supply from Red River of the North. This water is badly polluted Claimed not in use for drinking. City maintains deep driven well from which water is distributed by wagon to citizens for drinking purposes. Sanitary surroundings of drinking water supply good but such water is very liable to contamination in handling by tank wagon. City should purify river water at pumping station so that there would be no chance of anyone not aware of the local conditions, drinking the city water and endangering his life.

Sewerage system of combined type discharges through several outlets into the Red River of the North without purification.

Nashwauk: Population 1,500. Water supply pumped from dug timbered well 148 feet in depth with sectional area of 10 feet by 12 feet. Pump located in well about 80 feet from surface. This arrangement (pump directly over the water supply) is dangerous as the water may become contaminated from material from the pump attendent.

A combined sewerage system covers entire village and discharges into O'Brien creek which after flowing a distance of two miles discharges into O'Brien lake. Flow is very small. Few connections to the sewer system. When sewers are used as they should be, will probably be necessary to partially purify the sewerage to prevent a nuisance, although at present no inhabitants near sewer outlet.

Park Rapids: New water supply recently installed. Intake in Fishhook river above the dam in 16 feet of water. **Several privies empty into the river immediately above this intake.** It is claimed that the water is not used for drinking. This claim may be true in general but inevitably someone will occasionally drink the water and the risk of typhoid is always present.

No sewer system.

Perham: System of water mains into which no water is pumped except in case of fire. The well from which this water is taken could, with little trouble, be put in a good sanitary condition, and it would seem as though this should be done as the town already operates an electric light plant and the additional expense of supplying water to the town would be slight.

Red Lake Falls: Population 1,500. No water or sewerage system at present, but plans are under consideration for the construction of both.

St. Cloud: Population about 10,000. Water supply from the Mississippi river short distance above city. In 1907 when present pumping station was constructed, river water was abandoned for well water. A total of 19 wells were driven. These wells soon became exhausted and the question of whether more wells should be driven or whether river water should again be used was put to a vote of the consumers. Result of vote about 185 to 15 in favor of river water on account of its softness when compared with the extremely hard water of the wells. Wells were then abandoned and river water used.

While it is claimed that the river water is not used for drinking by the people in St. Cloud, still there are always some persons who will not heed the warnings of health officers. Also transients who do not know the local situation are in danger of drinking such water unawares. Water should be purified, so as to remove all such danger. A disinfecting plant, while not removing physical impurities of water such as color, turbidity, taste or odor, would remove pathogenic bacteria, the cause of typhoid and dysentery. Cost of such a plant would not be over $500.00, operating expenses would not be over $1.00 per day.

Sewerage system is of combined type, discharging unpurified sewage into Mississippi river.

St. Peter: Population 4,500. Water supply from two tubular wells each 8 inches in diameter, one about 350 feet and the other 592 feet in depth. Both are flowing wells. Overflow from shallower well discharged into stone curbed well used as storage reservoir for extra fire protection. Curbing of storage reservoir not tight and surface drainage enters. This reservoir was flooded at the time of the Mankato typhoid outbreak and was the cause of some 1,200 cases of dysentery. If use as reservoir is to be continued, it should be cemented so as to be absolutely tight and protected from surface drainage.

Combined sewer system discharges unpurified sewage into the Minnesota river.

Sauk Rapids: Population about 1,000. Water supply pumped from 4-inch driven well about 38 feet in depth. Sanitary surroundings good.

Sauk Rapids has no sewerage system but the need of one is felt. Is hindered by the burden imposed by present law.

Staples: Population about 2,200. Water supply pumped from a well located within the city. The water is a mixture of shallow-well and deep-well water. Casing driven from the bottom of the shallow well to a depth of 72 feet. Sanitary surroundings of this well are good.

Sanitary sewerage system recently constructed, with one or two street water openings. It discharges into small creek about one-half mile east of the city. The flow of water in this creek is very small and complaint of a nuisance has been made by the farmers living along its course, on account of its polluted condition. A sewage purification plant could be constructed at a small expense, which would remove the nuisance.

Thief River Falls: Population about 5,000. Water supply partly from a 10-inch driven well 190 feet in depth and partly from intake in Red Lake river. River intake below the sewer from a creamery. Also a hospital cesspool on the bank of the river a short distance above. The water works and electric light plant are in an especially prosperous condition and the city can well afford a perfect water supply.

An extensive sewerage system is now being constructed. This is to be, **unfortunately,** of the combined type. A separate system should be built because with Red Lake Falls, Crookston, and East Grand Forks dependent more or less upon the Red Lake river for their water supplies, the sewage from Thief River Falls will eventually have to be at least partially purified. With the combined system of sewers, this will be very expensive when compared with the cost of purification plant receiving only sanitary sewage. Also the present cost of constructing combined sewers is more than cost of separate system, since storm sewers need be located on but few streets.

Twin Valley: Population 700. Water from driven well 265 feet in depth Sanitary surroundings are bad, several privies being within 25 to 50 feet of the well, but the clay subsoil probably protects the well water from contamination.

No sewer system.

Two Harbors: Population about 4,500. An important shipping point. Water supply from Lake Superior, end of intake pipe about 600 feet from the shore. Two sewers discharge into lake, one on each side of the intake pipe and about three-fourths of a mile distant in each case.

Water supply not purified. Usually of excellent sanitary quality, but during storms occasionally contaminated. In the winter of 1909-1910 over fifty cases of typhoid fever in Two Harbors largely caused by contaminated water supply. To remove danger of another outbreak, the water supply should be protected by means of a hypochlorite disinfecting plant, preferably at the pumping station. Cost of construction, about $500.00, operating expense about 50 cents per day.

Sewage from one outlet passes through septic tank before going into the lake. Sewage from the other outlet receives no treatment.

Walker: Population about 800. Water supply from Leech Lake. Intake pipe extends about 175 feet from shore. End of intake directly on log boom. Considerable trouble in the past on account of pump valves being choked with bark, etc. The water supply like almost every surface supply which is not protected from contamination, is liable to be the cause of an epidemic. Here a disinfecting plant costing not over $300 and less than 50 cents per day operation, would effectually remove danger of such an epidemic.

No sewerage systems. Natural drainage excellent.

Warren: Population 1,800. Water supply from 200 feet driven well, the sanitary surroundings of which are good. Water supply is somewhat deficient. Water also objected to by some on account of salty taste.

A sewerage system discharges into Snake River, the sewage first passing through septic tank of recent construction.

The increasing amount of routine work demanded so much time and the cost of traveling expenses were drawing so heavily on the appropriation available, that it was soon necessary to discontinue this very desirable work. The municipalities having particularly bad conditions were drawn to the attention of the Board.

Certain investigations have been conducted which are of especial interest, as they represent the possibilities of this branch for useful service.

1. At East Grand Forks this division in co-operation with the laboratory, conducted an extensive test on the newly installed filtration plant in the summer of 1909. Without this test and the subsequent directions given

the city, the efficient operation of the plant could not have been obtained. The work of installing recommended improvements was not completed as the city did not carry out its part of the agreement with the Board.

2. At Hibbing an outbreak of dysentery was promptly met and dealt with by the Board. Mr. Childs of this division designed a temporary disinfecting plant for the water supply and the epidemic was immediately checked. Mr. Child's report on this case is given in appendix 11.

3. In August, 1909, the city council of Minneapolis visited Lake Mille Lacs for the purpose of viewing it as a possible source of water supply for that city. The State Board of Health was invited to send a respresentative and the engineer of the Board was delegated. Samples of water at different portions of the lake were obtained and an inspection of the shore line made. The run-off was guaged at the outlet of the lake. There was however little accurate information in regard to the lake, so a further survey was deemed advisable. The State Board of Health in co-operation with the State Drainage Commission and the U. S. Geological Survey, made extensive suroundings and a survey of the shore line. The work was done under the direction of Mr. Robert Follansbee, District Hydrographer of the U. S. Geological Survey. Later the engineer of the Board at the request of the city of Minneapolis, made, unofficially, an extensive survey and study of the possibilities of Mille Lacs lake with the result that it was definitely abandoned as a possible source of water supply for Minneapolis. It is worth noting here that after suffering for years from water borne typhoid, Minneapolis is constructing a purification plant for its water supply from the Mississippi river. Since Minneapolis has determined to use this river as a source of supply, the pollution above, should be carefully supervised. This will be referred to below. Mr. Follansbee's report is as follows:

St. Paul, Minn., Dec. 3, 1909.

Dr. H. M. Bracken, Executive Officer, State Board of Health, St. Paul Minn.

Dear sir: I submit herewith my report on the Mille Lacs Lake Survey, which was undertaken by a co-operative agreement between the State Board of Health, the State Draining Commission, and the U. S. Geological Survey.

After a reconnaissance of the lake region the survey party took the field September 28, and returned to St. Paul November 23. A traverse line was run around the shore of the lake by means of the transit and stadia method and in this way the shore line determined and signal points established for soundings. Frequent asimuth checks were obtained by observations on Polaris which kept the traverse errors down so well that the closing error was 100 feet in 73 miles when the computations were corrected for the curvature of the earth.

Soundings—The steamer Luella was chartered for three days and with it eleven lines of soundings across the lake were made. These soundings were started from a point to the traverse line and were made during equal intervals of time while the steamer held a compass course with uniform speed. The ending of each sounding course was tied in to the nearest traverse point. In addition to the deep soundings, two members of the survey party made a circuit of the lake in a row boat, getting the location and distance from shore to the two-foot and five-foot depths, every mile around the lake. These distances were located by stadia from the nearest traverse point.

Topography—The topography adjacent to the shore was sketched in order to study the feasibility of raising the lake level for storage. Mille Lacs lake is nearly surrounded by a barrier beach or ice barrier which takes the form of a long narrow mound ranging in height from three to twenty feet with an average height of about five feet, and having its longest axes parallel to the shore line. Back of this barrier the land is low and flat, and whenever a stream enters the lake there is a break in the barrier which would cause the interior land to be flooded, if the lake level were raised sufficiently. Therefore to determine the height to which the lake levels could be raised without flooding the lands behind the ice barrier a somewhat detailed study of the areas traversed by the larger lake tributaries was made by means of magnetic traverses and sketching.

On account of the low ground adjacent to the lake, it will not be feasible to raise the lake level to any considerable extent, but it may be possible to affect the required storage by drawing down the water surface during the low period, and then utilize as storage, water that is included between the two levels. For this reason the inshore soundings were taken. They will show not only the reduced area at the lower level but will also show the effect on navigation that such lowering will have.

Cost—As will be seen by the foregoing, the scope of the survey was enlarged from that originally planned so that the total cost of the field work and supervision was $1,097.95, divided as follows:

Services	$585.85
Travel	290.95
Subsistence	202.00
Supplies	19.15
Totals	$1,097.95

In accordance with your letter of October 6, vouchers amounting to $298.33 have been presented to you for payment.

Published Results—This office is now at work plotting the field notes for transmission to the Washington office where the final map will be published. Your request for 100 copies has been referred to the Chief Hydrographer for action.

Yours very truly,
(Signed) ROBERT FALLANSBEE,
District Engineer.

Miscellaneous work by the division has consisted of examination of hospitals, inspection of site of asylum at Willmar and design of portable water disinfecting apparatus. This latter is worthy of special note. It was originally suggested by Mr. Whittaker of the laboratory division and was designed by Mr. Childs of the engineering division and has been completed and is now ready for any emergency where the water supply of any community using 1,000,000 gallons or less per day, becomes contaminated.

Plans and photographs of the plant are shown in Appendix III. The whole outfit including all accessories cost about $125.00. It may be said that this plant is the first of its kind (portable) in the country and it has attracted considerable attention among sanitarians outside of the state.

A trial of the plant was made at Baudette at time of the great fire October of 1910. This in connection with the operation of a similar plant at Brainerd has led to the design of a still simpler and less costly plant for emergency use. Two other designs for plants of a more permanent character are now being prepared.

In the legislature of 1909 a bill was introduced providing that plans for all water works and sewer systems be submitted to the State Board of Health. Proper appeal from the decisions of the Board in regard to the plans was provided, provision being made for a review by a commission of engineers and later for court review if necessary. The bill was criticized as giving the Board too much arbitrary power, while in reality it would prevent possible future trouble and expense which might be caused as a result of an order of the Board which already has sanitary control of streams and lakes in the state.

(See Revised Laws of 1905, Sec. 2131, arts. 2 and 5; also sections 2147 and 4987.) The purpose of the bill was misunderstood in the senate where it was killed by a vote of 32 to 28 after having passed the house 69 to 23. The bill is as follows:

A BILL.

For an Act to require the State Board of Health to examine plans for, and to inspect the construction and operation of all municipal and state water works and sewerage systems throughout the state except in cities of the first class.

Be it enacted by the Legislature of the State of Minnesota.

Section 1. That the term "municipal and state waterworks and sewerage system" wherever used in this act shall include all existing and proposed waterworks and sewerage systems within the boundaries of the state.

Sec. 2. That the term "waters of the state" wherever used in this act shall include all streams and springs, and all bodies of impounded surface and ground water, whether natural or artificial, within the boundaries of the state.

Sec. 3. That the term "sewage" wherever used in this act shall be defined as that substance which contains any of the waste products or excrementitious matter or other discharge from the bodies of human beings or animals, or of the waste products of industrial processes; that the term "sewerage system" wherever used in this act shall include any appliance or part thereof used in the disposal of sewage.

Sec. 4. Every municipal corporation, company or individual supplying or authorized to supply water to the public, or disposing of sewage or causing sewage to be disposed of within the state, shall within six months after the passage of this act file with the State Board of Health a certified copy of the plans and surveys of the waterworks with a description of the source from which the supply is derived, or of the complete sewerage system with a description of the place of disposal; and no other source of water supply or place of disposal shall be adopted without a written permit from the State Board of Health as or hereinafter provided.

Sec. 5. No municipal corporation, company or individual, shall construct waterworks for the supply of water to the public within the state, or extend the same, without a written permit from the State Board of Health, provided this shall not apply to the extension of water mains.

The application for such permit must be accompanied by a certified copy of the plans and specifications for such waterworks, with a description of the source from which it is supposed to derive the supply; and no additional source shall subsequently be used for waterworks without a similar permit from the State Board of Health.

When application is made for a permit under either of the provisions of this Section it shall be the duty of the State Board of Health to proceed to examine the application together with the plans and site of the proposed waterworks, and as soon as possible it shall make a decision in writing.

Sec. 6. No municipal corporation, company or individual, shall place or permit to be placed, or discharge or permit to be discharged, or to flow, into any of the waters of the state any sewage except as hereinafter provided.

Sec. 7. Upon application to construct or extend the use of any of the waters of the state, or any sewerage system in the state, being duly made to the State Board of Health by a municipal corporation, private corporation, company, individual, or public authority having charge of a sewerage system or any of the waters of the state, the State Board of Health shall consider the case presented and whenever in its opinion the general interests of the state would be subserved thereby, the secretary of the State Board of Health shall issue a permit for the construction thereof.

The State Board of Health shall fully investigate the merits of each case by personal inspection and hearing before such permit is issued.

Sec. 8. Whenever complaint in writing is made to the State Board of Health setting forth that a city, village, corporation or person is discharging, or permitting to be discharged, any sewage or other wastes into any stream, water course, lake or pond, and is thereby creating a public nuisance detrimental to health or comfort, or polluting the source of any public water supply, it shall be the duty of the State Board of Health to investigate the conditions complained of; and if it shall appear after investigation that cause for complaint exists, it shall notify such city, village, corporation or person causing the contamination of such stream, water course, lake or pond, of its findings, and give them an opportunity to be heard, and after such hearing, if the State Board of Health determines that improvements or changes are necessary and should be made, said Board shall notify such city, village, corporation or person to install such works or means satisfactory to said Board for purifying or otherwise disposing of its sewage or other wastes, or to change or enlarge existing works or means in a manner satisfactory to said Board; such works or means must be completed or put into operation within a reasonable time fixed by said Board; provided that no city or village that is now discharging sewage into any river which separates the State of Minnesota from another state shall be required to install purification works so long as the unpurified sewage of cities or villages in any other state is discharged into said river above said Minnesota city or village.

Sec. 9. Whenever the board of health, or health officer, of any city or village, or ten electors thereof, file with the State Board of Health a complaint in writing setting forth that it is believed that the public water supply of such city or village is impure or dangerous to health it shall be the duty of the State Board of Health to forthwith investigate the conditions complained of; and whenever the State Board of Health finds after investigation that the public water supply of any city or village is impure and dangerous to health, and that it is not practicable to sufficiently improve the character of such supply by removing the source or sources of pollution affecting it, or if said Board finds that such water supply is being rendered impure by reason of improper construction or inadequate size of existing water purification works, it shall notify such city, village, corporation or person owning or operating such water supply of its findings and give an opportunity to be heard, and after such hearing if the State Board of Health determines that improvements or changes are necessary and should be made said Board shall notify such city, village, corporation or person owning or operating such water supply to change the source of supply, or to install and place in operation water purification works or device satisfactory to said Board, or to change or enlarge existing water purification works in a manner satisfactory to said Board within a time to be fixed by said Board.

Sec. 10. Whenever the State Board of Health finds upon investigation that any water or sewage purification works, because of incompetent supervision or inefficient operation, are not producing an effluent as pure as might reasonably be obtained from such plant, and by reason of which any public water supply has become dangerous to health, or any stream or body of water has become offensively polluted or has become a public nuisance, said Board shall issue an order to the officer, board or department of any city, village, corporation or person having charge of or owning such plant, to secure an effluent as pure as might reasonably be expected from such plant, and satisfactory to said Board: and if such officer, board or department of any city, village or corporation fails for a period of five days after receiving such order to secure such an effluent the State Board of Health may order such officer, board or department, or owner of such plant, to appoint within two days, and pay the salary of, a competent person approved by the State Board of Health to take charge of and operate such works so as to secure the results demanded by said Board.

Sec. 11. If in any case any order of the State Board of Health, made in pursuance to the provisions of this act, is not acceptable to any city, village, corporation or owner affected thereby, such city, village, corporation or owner shall have the right of appeal as follows:

To-wit: The necessity for and the reasonableness of such order may be submitted to two reputable and experienced sanitary engineers, one to be chosen by the city, village, corporation or owner to which such order of the State Board of Health applies, and the other to be chosen by the State Board of Health, but not regularly in the employ of the Board.

These two shall act as referee engineers.

If the engineers so chosen are unable to agree, they shall choose a third sanitary engineer of like standing, and the vote of the majority shall be final and binding unless an appeal is taken as hereinafter provided. The referee engineers herein provided for shall have the power by order duly filed with the State Board of Health, notice of which said filing shall forthwith be given to the city, village, corporation or person interested therein, to affirm, modify or reject the order of the State Board of Health submitted to them.

Any city, village, corporation or person aggrieved by such order, or the State Board of Health, may appeal therefrom to the district court of the county in which said water works or sewerage system is located at any time within 30 days after notice of the filing of said order as hereinbefore provided. Such appeal, if taken by the State Board of Health, shall be made by a service upon the city, village, or corporation or person interested in said water works or sewerage system, and by filing said notice of appeal with the clerk of the district court. If such appeal be taken by a city, village, corporation or person, notice of said appeal shall be served upon the secretary of the State Board of Health, and such notice filed with the clerk of the district court; if such appeal be taken by a private corporation or person, a bond on appeal shall be executed by appellant in the sum of five hundred (500) dollars, with good and sufficient sureties, to be approved by the judge of the district court, conditioned as are ordinary bonds on appeal in civil actions.

The decision of such referee engineers shall be rendered within a reasonable time to the State Board of Health, and shall be enforced by said Board in the manner provided for in this act.

The fees and expenses of such referee engineers shall be equally divided between the city, village, corporation or owner requesting the investigation and the State Board of Health.

Sec. 12. It shall be the duty of every municipal council, department or officer having jurisdiction to provide for the raising of revenues by tax levies, sale of bonds or otherwise to take all steps necessary to secure funds for the purpose or purposes enumerated in this act; provided that the bonds herein authorized to be issued for such purpose or purposes shall not exceed three per cent of the total value of all property in any city or village as listed and assessed for taxation, and may be in addition to the total bonded indebtedness allowable.

Sec. 13. Any public officer, person or officer of private corporation who, for a period of thirty (30) days after a notice has been given in writing to him by the State Board of Health of its findings, shall fail or refuse to do or perform any act or acts required of him to be done by this act, and for which he alone is responsible, shall be guilty of a misdemeanor, and upon conviction thereof be punished by a fine of not less than fifty (50) dollars or more than one hundred (100) dollars, or by imprisonment in the county jail of not less than sixty (60) or more than ninety (90) days.

Sec. 14. This act shall take effect and be in force from and after its passage.

It is proposed to re-submit this bill to the legislature of 1911. Its purpose is to ensure the most efficient sanitation at the least cost.

In Minnesota as in many other states there is an immense amount of money expended upon public works of which a large part is for unnecessary or poorly designed structures which sooner or later must be replaced, because they do not perform the functions for which they were intended. This division has numerous records of such instances in Minnesota. When such works are of such a nature that their operation offects the public health, not only is the economy of public funds affected, but also that of the public health. Furthermore not only may the health of the particular community in which these works are located be affected, but also the health of any other locality to which the disease may be carried by persons who before moving have contracted it from defective or insufficient municipal sanitation. Communicable diseases travel without regard to municipal or other man-made boundaries and citizens of one community suffer for the sins of another.

The practical solution of the problem is the prevention of the disease. Since no one community controls another, but all owe their very existence to the state, it is evident that it is the duty of the state to govern in such affairs as are of mutual concern to all. An instance is that of communicable diseases which can only be prevented through the proper control by the state. It is the general custom for each city or village to consider only its individual necessities when about to construct municipal improvements. The city may or may not employ trained engineers, and even if it does so, and it should, the works may not be most economical and efficient when the interests of other parts of the state are considered. It is poor economy for the state as a whole to permit a dozen cities to be pouring untreated sewage directly into a stream which is being used by some unpurified, for domestic purposes.

The State Board of Health should not be looked upon as an arbitrary power which might without reason demand that this or that city purify its sewage or seek a new source of water supply or what-not, but on the other hand it should be looked to for expert advice by all municipalities in the state in sanitary affairs. The State Board of Health should be able to give such advice at all times. When a municipality has a project under consideration which involves construction, it is economy to carefully consider all general methods and details before commencing construction. If the State Board of Health were properly equipped and called in consultation on every piece of sanitary construction in Minnesota, several hundred thousand dollars would be saved annually, to say nothing of may lives.

The engineering division should be in a position to take up problems at their inception and work with the engineer engaged by the municipality. This would be far better than reviewing and criticizing plans after they have been drawn and in many cases requiring them to be more or less extensively revised later. Any legislation which would accomplish this would not only work no hardship on anyone, but would enable the division to give most for whatever it costs the state to support it. To properly meet this need, the bill presented to the last legislature should be enacted into law.

PUBLIC WATER SUPPLIES.

(a) Ground Water Supplies—

Those communities which have underground sources of water supply are usually safe from other than local contamination of the water. The quality of such waters is usually affected by iron, which often causes a yellowish or brown turbidity due to the growth of the organism known as Crenothrix. While this iron and also the Crenothrix are harmless, they are very unpleasant. Usually they can be easily removed by aeration. An experimental iron removal plant was erected at Winona under the direction of the engineer of the Board two years ago, which at a small cost removed practically all of the iron naturally in the water. There are many communities in Minnesota which could add greatly to the convenience of their citizens and to the income from their waterworks by adding to the desirable qualities and consequently increasing the value of their city water supply.

Another very common trouble with the ground water supplies of the state, is their hardness. Often these waters can be softened at a slight expense to such an extent that they could be used for any purpose. While the advice which the State Board of Health could give through this division in regard to the construction of water softening plants would have little to do directly with the healthfulness of the municipal supply itself, still by promoting the use of one central supply, well guarded from contamination, the many small contaminated surface wells would be less in number and so, indirectly, but none the less surely, would the public health be benefited. There are a number of deep well municipal supplies in the state which from a direct sanitary point of view need attention.

(b) Surface Waters—

The surface supplies of the state are without exception subject to contamination, infrequent and accidental in some cases and regular and inevitable in others. The pollution may come from the municipality itself or from some other one situated elsewhere on the same stream or lake. **It is absolutely impossible to prevent pollution of streams and lakes in any region except it be uninhabited. It is impracticable and uneconomical to substitute the purification of sewage to the point where it is safe as drinking water in the place of purification of water.**

Sewage is eliminated from water in three stages:

First. Just before the sewage enters the stream or body of water by means of purification works.

Second. By the natural purifying power of water in large quantity.

Third. By complete purification of the water just before it enters the distribution system of a city's water system.

To place undue emphasis upon the first is to over-estimate its reliability; to neglect the second is to leave unutilized a great natural resource; to rely upon the last as the real protection is in accordance with the best experience derived from long continued and careful observation of the highest authorities on sanitation.

The purification of water has reached such a point of perfection and low cost in America that no city or village having a surface supply can afford to be without it. Only ignorance of the ease of purifying water and of the possible calamitous results of not purifying it prevent municipalities from thus protecting themselves. A total cost of one twenty-fifth of one cent per day for each person benefited would transform the worst of our river waters into clear, sparkling, healthful water unexcelled by any spring water. There are a number of water purification plants in this state, but without the assistance of some one of the staff of the engineering division of this Board, none of them has produced a satisfactory effluent.

It is often asserted where a water supply is first installed that its principal object is that of fire protection, and that quality is of secondary importance, if indeed it is of any importance whatever. It must be remembered that in such cases the supply will be used more or less for domestic purposes and if impure is therefor dangerous. The income from a water supply which can be safely used for drinking is sure to be greater than one that cannot be so used and for that reason alone a safe supply is preferable.

SEWERAGE AND STREAM POLLUTION.

As was mentioned under "Water Supply" the thorough purification of sewage as a rule, is impracticable and uneconomical. Some degree of purification is however unsually desirable and often necessary. The conditions existing along the stream itself will in each case determine the degree of purification which should be obtained. Usually the object of the sewage purification plant is to prevent a condition offensive to sight or smell.

Sewage contains 999 parts pure water in each 1,000 parts. This water in obedience to the law of gravitation finds its way eventually to some water course or lake. If the water course is of a volume of 40 or more times as great as that of the sewage, there is usually no offense, provided the stream receives no other sewage. It is difficult to give any rough guide as to the limit of the power of a lake to absorb sewage without nuisance. In some cases there is a limited local offense unless some form of mechanical separation of the solids of the sewage is affected on land.

Sewage purification may consist of:

First. Mechanical separation (screening) to prevent offense to sight.

Second. Mechanical separation (screening and sedimentation to prevent offense to sight.

Third. Mechanical separation followed by filtration, single or multiple, to prevent offense to sight and smell.

Fourth. No. 3 followed by disinfection, which in addition destroys pathogenic bacteria, and consequently the power of the effluent for harm.

The last is usually only necessary in case of an epidemic which may threaten an unpurified water supply below. Very often simple screening and sedimentation are sufficient. The utilization of sewage for agricultural purposes is economical only in the arid regions.

There are two principal types of sewer piping systems: (1) the combined and (2) the separate. In the former the pipes must be very large to accommodate the large amount of water running off at times of heavy storms. In the latter the pipes are small, accommodating the house wastes only. They are usually supplemented by a small number of large sewers to drain off the storm water. In case purification to the extent of sedimentation of filtration is necessary, this type is much better adapted. A six-inch sewer will often be ample to take the sewage of 1,500 persons, while to take the storm water from the area covered by this population for average Minnesota conditions, would require one at least three feet in diameter. The separate system is usually the most economical as well as the best adapted for purification works. Every city ought to weigh carefully the advantages and disadvantages of these systems before deciding upon either.

REFUSE DISPOSAL.

Important as the elimination of a filthy water supply is, it is scarcely less important than that of the elimination of refuse which is ejected from every human habitation and which becomes filthy and a danger as well as a nuisance unless quickly removed. The whole success of modern sewerage depends on the rapid removal of waste and likewise the success of other refuse disposal depends upon prompt removal. In almost every city and village in the state, piles of stinking garbage and manure can be found in many places. They are breeding places for flies and insects which act as carriers of disease. Their elimination will be certain when each village organizes a system of daily collection and disposal. The collection from a community of 2,000 can be made by one team. This disposal should be by burning either in the open at a distance from any houses or by means of an incinerator.

The engineering division of this Board should be in a position to help in this problem. A study of local conditions is necessary as in other sanitary problems. It is one which needs solution and one which will soon demand it.

SCHOOL HOUSE CONSTRUCTION.

Regulations governing sanitary requirements for school house construction have been formulated. They aim to provide the child with sufficient air-space, ventilation, light and other features concerning sanitation. The present regulations are as follows

Regulations adopted Jan. 11, 1910.

CONSTRUCTION OF SCHOOL BUILDINGS.

146. No school room or class room, except an assembly room, shall have a seating capacity that will provide less than eighteen (18) square feet of floor space and two hundred and sixteen (216) cubic feet of air space per pupil, and no ceiling in buildings hereafter to be erected shall be less than twelve (12) feet from the floor.

147. A system of ventilation, in order to be approved by the Minnesota State Board of Health, shall be capable of furnishing not less than thirty (30) cubic feet of air per minute for each person that the room will

accommodate when the difference of the temperature between the outside air and the air in the school room shall be thirty (30) degrees F. or more.

148. In a gravity system of ventilation in connection with a furnace or steam plant, the flues for admitting fresh air to the room shall have a horizontal area of not less than one square foot for every nine (9) persons that the room will accommodate.

149. The flues for a "plenum fan" system of ventilation shall have a horizontal area of not less than one square foot for every fifteen (15) persons that the room will accommodate. The ventilation of school buildings by this system shall be so designed that the air pressure in any class room shall be in excess of that of the outside air.

149a. The direct-indirect system of ventilating shall not be used. By "direct-indirect" is meant the introduction of cold air from the outside of the building at the base of a "direct" radiator.

150. The glass area of windows shall equal one-fifth of the floor area of the school room.

151. In all rooms not exceeding twenty-five (25) feet in width, all the light shall be admitted to the left of the pupils when seated.

152. In rooms exceeding twenty-five (25) feet in width, light shall be admitted to the left and rear of pupils when seated.

153. Translucent instead of opaque shades shall be used in the windows for controlling the light.

154. The top of the windows shall be as near the ceiling as the mechanical construction of the building will allow.

155. No cloak room shall be less than six (6) feet wide, nor shall it have less than one window.

156. The so-called "sanitary wardrobe," which allows the foul air of the room to pass through the clothing of the children before passing into the vent duct, shall be condemned as unsanitary.

157. One and two-room buildings heated by hot air, stoves or furnaces shall have a cold air intake, the cross section of which is equal to 0.004 of the floor area of the room or rooms heated. The vent flue shall have a net area equal to that of the cold air intake.

These regulations have in the past two years been changed as experience with the problems in this state have dictated. It is worthy of notice that many of the larger schools of recent construction in the state are models in sanitary requirements. In nearly every case the school boards have been anxious to build substantially for the future not only of the building, but for the future physical welfare of the pupil. One of the discouraging things is the unwillingness of the rural communities to furnish a proper air supply in the small one-room schools. It is possible to have in the country all the advantages of the city schools but these must be paid for. One desirable attraction of country life is omitted if inferior schools are built. If the coal bill is high because more air is heated, it means that the pupil is brighter because of that increase of air. Much of the traditional dulness of the school hours of childhood is due to the deadening influence of foul air breathed over and over again. It would be better to shorten the school year and give the child a chance to remain alert while there. He would learn as much in seven months as he now does in nine and at the same time would not be subject to the vile contagion of the stagnant air in a poorly ventilated school room.

Some means of inspection of new school houses should be provided. This would greatly add to the effectiveness of the regulations and many school boards could be helped by the personal presence of an expert in school house construction. In many cases economics could be effected and better results secured at the same time. It is suggested that a law placing about $6,000 per annum of the income from the school fund to the credit of the State Board of Health for this purpose be enacted.

SANITATION IN PUBLIC BUILDINGS.

Public buildings in order to be sanitary should in the first place be properly constructed and properly maintained. The easiest and most economical way to accomplish this is to have special expert advice from some one acquainted with the difficulties surrounding building operation.

The present funds at the disposal of the Board for engineering work are ridiculously insufficient to alone care for the sanitary features of public water supplies. However, other work demanding attention by this division is perhaps just as important. It is important to see that reasonable sanitary building ordinances exist and are enforced in every village. A beginning should be made to improve present conditions, not by harsh regulations which cannot be complied with, but by careful consideration of the needs of each city. Disagreeable and dangerous conditions can be largely avoided with ease when once a reasonable system for their elimination is established. Before any attempt is made to make changes in regulations their desirability should be clearly demonstrated.

Conclusion:

The subjects which have been mentioned in this report are:

1. Public water supply.
2. Sewerage and stream pollution
3. Refuse collection and disposal.
4. School house construction.
5. Regulations for public buildings.

1. For public water supplies there is needed more detailed study of present conditions in order that the most value may be obtained from the plants and that pure water may be obtained.

2. The subject of sewerage, sewage disposal and stream pollution can be best understood by considering the drainage area of each river separately. No general rules can be laid down for Minnesota conditions at present, because there is not enough data available. The only way to determine the amount of pollution in a large stream is by a series of observations extending over a considerable length of time. In small streams where the pollution can be seen or smelled no more investigation is necessary. It can be accepted as an axiom that surface water in inhabited regions will always be unsafe for drinking purposes and should be purified; this implies that some sewage must be admitted to rivers. This is the universal and inevitable practice all over the world. The question of how much, is a matter to be settled for each stream, depending largely on the relative volume of the stream and the sewage.

3. Refuse collection and disposal is a sanitary necessity in every decent community of human beings. It is easy only when systematized. Regular

collection and a definite place of disposal should be established in every city and village.

4. School house construction is to some extent controlled at present. Plumbing, ventilating and lighting should have some means of enforcement. The only effective method is by inspection. Inspectors who can demonstrate to school boards and builders are needed.

5. The same principles that apply to school house construction also apply to other public buildings. Regulations and means for enforcement are needed.

The greatest need at present is not for more stringent laws, but for means to properly carry out the intent of the present laws. An engineering corps able to render the proper service to municipalities and rural districts should have $75,000 per annum for its support. I estimate that two years will be required to properly organize and drill a corps which would consist of between 30 and 40 trained technical workers. For the first year $30,000 should be provided, for the second year, $50,000 and for the third $75,000. This money would be more than saved by economies in construction, while the main object, the public health would be protected.

The State Boards of Health of Massachusetts, New York, Pennsylvania, Virginia and Kentucky spend on the average, 24 per cent of their total appropriation for engineering. Twenty-four per cent of the total income of the Minnesota State Board of Health is equivalent to $1,060.00 per month. The present appropriation is but $208 per month.

Massachusetts which is a leader in state hygiene, spends over 35 per cent of its State Board of Health funds for engineering. Ohio spends 38 per cent and Kentucky 33 per cent. Minnesota spends only about 4½ per cent for engineering.

The following table is of interest:

State.	Total Appro.	For Eng.	Pct. of Total Devoted to Eng.
Ohio	$50,000	$19,000	38.0%
New York	150,000	17,000	11.2%
Virginia	21,000	3,000	14.2%
Massachusetts (1908)	131.000	48.000	36.4%
Pennsylvania	500,000	50,000+	10.0%+
Kentucky	30,000	10,000	33.3%
Average			24.0%
Minnesota	$53,000	$2,500	4.7%

APPENDIX NO. 1.

Work of the Engineering Division in the Tests of the East Grand Forks Water Purification Plant, August, 1908, to January, 1910.

The city of East Grand Forks is located upon the Red River of the North near the junction of this river with the Red Lake river.

For the purpose of furnishing a pure water supply for the city a pumping station and filter plant has been recently constructed. This plant was designed by Loweth & Wolff, consulting engineers, St. Paul.

It is located upon the north bank of the Red Lake river about a half mile above its mouth, and was completed early in the summer of 1909.

The contract for the filter called for a certain bacterial efficiency and the State Board of Health was requested to make tests to ascertain whether the contract requirements had been met. Accordingly, on August 1 and 2, Mr. Frederic Bass, director of the engineering division, and Mr. H. A. Whittaker, of the laboratory division, visited the plant and made a preliminary test and inspection. This test showed that the plant was not operating as it should and that the contract requirements were not being met.

Accordingly, it was decided that a series of tests be undertaken later in the year and a contract was drawn up between the city of East Grand Forks and the State Board of Health which provided that the State Board of Health should thoroughly test the filter and that the city should spend a sum not exceeding $2,000 in making changes which should be recommended as the result of these tests.

These tests were carried on by Mr. H. A. Whittaker, of the laboratory division, and by Mr. J. A. Childs, assistant engineer. Certain changes were made during the test, and others recommended.

Before discussing the results of the tests, a brief description of the plant will here be given. The water flows by gravity from an intake near the shore of the Red Lake river to an intake well in the pumping station, from which it is raised by means of a centrifugal pump to the settling basins. These settling basins are in two units, each of which was originally divided into three basins, the water flowing through each in succession. After passing through the settling basins the water enters the collecting trough, from which it is fed on to the filters, of which there are two units completed and one to be completed for future use. Upon passing through the filters the water enters the clear well below, from which it is pumped into the mains and elevated storage tank.

For washing the filters the reversal of flow only is used; no air or raking device being provided.

To assist in the sedimentation, alumnious sulphate is added to the water before passing through the settling basins. During the early period of these tests the alum only was used, and later it was combined with the hypochlorite treatment.

As a result of the tests, the following recommendations were made:

First. That the baffle walls in the settling basins be removed.

Second. That the stilling chambers at the inlet and of the settling basins be extended over the whole width of the basins.

Third. That the weir at the outlet end of the basins be extended over the whole width of the basin.

Fourth. That a layer of finer sand be placed upon the surface of the filters.

Fifth. That a mixing device for the hypochlorite and better administering devices for both the alum and hypochlorite be provided.

Of these, Nos. 1, 2 and 3 were carried out and plans were drawn by the engineering division showing the proper arrangements called for by the fifth recommendation. A copy of these plans is attached.

The tests showed conclusively that, as originally designed, and using the alum treatment only, this plant could not be made to meet the contract requirements. Even if all the recommendations had been carried out, it is doubtful if it could be made to operate successfully at all times, using the alum treatment only. With the changes which were made in the settling basin, the period of sedimentation was increased from a few minutes to over an hour. With the introduction of the hypochlorite treatment a very satisfactory effluent from a bacteriological point of view was obtained.

These experiments at East Grand Forks in this new process of disinfecting water by means of the hypochlorite treatment gave the State Board of Health experience and knowledge in its use which has since proved invaluable in other places.

seemed the most feasible at this time, its use was recommended by Mr. Childs. He instructed the water commission as to the design of a temporary plant, which was built by them, and put into operation under the direction of Mr. H. A. Whittaker, of the laboratory division.

It may be said in closing that the epidemic stopped as soon as the hypochlorite treatment commenced, and that at no time since has the water, in any of the samples taken, shown the presence of pathogenic bacteria.

ASSISTANT ENGINEER.

APPENDIX NO. III.

The Portable Emergency Hypochlorite Plant.

The hypochlorite treatment for the disinfection and thus rendering harmless for domestic use a polluted water supply has been rapidly coming into use during the past two years on account of the simplicity of the apparatus required and the extremely low cost of operation. In Minnesota the cities of Minneapolis, Hibbing, East Grand Forks, Breckenridge, Brainerd and Baudette are already using this treatment for disinfecting their water supplies.

In some places a normally good water supply may become suddenly infected, due to some unforeseen local condition. Such instances in Minnesota are those of Mankato, St. Peter and Hibbing. In each of these places the infection was sudden, and in the case of Mankato and St. Peter it was of a temporary nature only.

Of course, the best and quickest method of disinfecting a contaminated water is by boiling, but in every city there are numbers of people who either will not or cannot take this precaution. There are others, too, who may be strangers in the city and ignorant of existing conditions who are thus exposed to danger. It is necessary, therefore, for the protection of these people, that all the water be rendered safe at its source, and the quickest method of doing this is by means of the hypochlorite treatment.

In the case of the Hibbing epidemic this treatment was advised and a plant installed, but not without some delay in construction. This experience suggested to Mr. H. W. Whittaker, of the laboratory division, the desirability of the State Board of Health owning and operating a small emergency hypochlorite plant which could be easily transported to any portion of the state and set up and put into operation within a few hours of its arrival. He brought this to the attention of the Board at its July meeting, and a sum of $250 was appropriated with which to build such a plant. The design and construction of this plant was placed in charge of Mr. J. A. Childs, the assistant engineer.

The plant consists of a mixing tank, solution pump, storage tanks and administering tank.

The mixing tank is of sheet iron and is about 30 inches in diameter by the same in depth. A hollow cone is fixed on the inside, within which revolves a propeller, which drives the water through and around it, thus agitating and mixing the hypochlorite. From the mixing tank the solution is pumped up into the storage tanks. These storage tanks consist of two well-made oak barrels, specially constructed without bung-holes so that they can be made air-tight. From the storage tanks the solution is fed automatically to the administering tank, from which the required amount is fed into the water supply.

This apparatus is capable of treating a million gallons of water per day or less. This plant was first tried at Baudette, Minn., which town was destroyed in a recent forest fire. The water supply was taken from the Rainy river, and the intake was so situated that it might receive sewage from Baudette, Spooner and Rainy River. While none of the typhoid which then existed in Baudette could be traced directly to the city water, still the conditions were such that it seemed advisable to treat the water with hypochlorite, so the emergency plant was sent for and installed under the direction of Mr. Childs.

It may be interesting to note that it took a little over two hours to set up this apparatus and get it running. The steel mixing tank was not used, as the amount of water consumed daily was so small that it could be readily mixed in a barrel by hand.

The accompanying photograph shows the apparatus as it looked when set up for operation. The storage barrels are shown on the upper platform, one being partially hidden behind the other. The mixing barrel is shown on the floor under the others, and the pump is shown at the left. The administering device is shown on the bench at the right.

The cost of this plant, with sheet iron mixing and regulating apparatus, was about $150.

At Baudette it was impossible to use the mixer on account of inadequate power, and a hand-mixing device was substituted. This worked so well that it seemed to justify the belief that a much less costly mixer of wood, operated by hand, would be adequate for emergency cases. Such apparatus would be lighter, simpler and would cost less for transportation; moreover, if any part were lost, it could easily be replaced. The administering device was left at Baudette, and no trace of it has since been found. Had this been of wood, the loss would have been inconsequental. A new design for a less costly plant has been prepared and plans are attached to this appendix. This plant can be constructed for about $50 and is capable of disinfecting 1,000,000 gallons of water per day. Two types are shown. A photograph of a similar plant erected at Brainerd is attached also, galvanized iron pipes there being used in place of the rubber proposed in this plant.

It is worthy of note that this plant has attracted considerable attention. Among others, the surgeon general's office and the quartermaster general's of the United States Army have asked for information, and plans have been sent them.

APPENDIX NO. IV.

REPORT ON EUROPEAN TRIP.

The principal objects of this trip were to study present French, German and English municipal sanitation, with special reference to water purification, sewage disposal and purification and refuse disposal.

For some reasons the present has been the most favorable of the last ten or fifteen years to observe European practice and compare it with that of America in so far as such comparisons are possible. In America the last two years have witnessed a remarkable advance in the science of water purification, with introduction of disinfection methods. No such advance is noted in any part of Europe, although the English engineers and chemists are beginning to be interested in this phase of the subject. On the other hand, remarkable progress has been made in certain directions in the purification of sewage in England, and especially in Germany during the last two years.

In the matter of refuse disposal, the best European and American practice is about the same, although during the last year or two certain German cities have been successful in using high temperatures and heavy forced draft for their incinerators. In all of these plants, as well as the best of those in America, the refuse is utilized as a fuel. The so-called utilization plants, where an attempt is made to recover certain oils and greases, formerly used quite widely in America and still to a limited extent, are nowhere found.

The possibilities in the use of ozone for disinfection seem very promising, for the disinfection of air particularly. In Paris ozone has been used experimentally and successfully for the disinfection of water, but at a great cost as compared with chemical disinfection.

WATER SUPPLY.

In Paris and France, water purification is largely in the hands of commercial interests controlling patented apparatus, such as the Puech-Chabal process, the various ozone treatments, the non-submerged filters, the ultra-violet rays system, and others. Apparently very little progress is being made, The clumsy and expensive purification plants are effective and usually well managed, but inferior in economy to some of our own installations. At Ivry, Paris, the water of the Seine is filtered eight times successively before being delivered to the city. At Suresnes, just below Paris and above the sewage fields, the water of the Seine is filtered six tims in succession previous to delivery to some six or seven small municipalities which have pooled their interests in water supply. In these plants, coarse grain filters of small depth take the place of sedimentation basins in American and English practice. Similar installations have been made at Cherbourg and elsewhere.

The city of Paris has been experimenting with ozone processes for purifying water for some years. In 1909 two companies, the Siemens de Frise and the Abraham-Otto, had produced almost sterile effluents from filtered water, and were about to be awarded contracts by the city for large permanent plants, when a third company, the Gerard, of Brussels, entered the field, and at the time of the writer's visit were conducting experiments under the supervision of M. Colmet Daage, the chief city engineer of Paris, and M. H. Miquel, director of the municipal laboratory of Paris at Montsouris. The whole matter has been delayed, although the adoption of ozone processes seems certain. Prejudice against the use of chemicals, established by the commercial interests controlling special processes, is responsible for the adoption of ozone. The delay in the installation was unexplained.

At the Sorbonne in Paris, Prof. Recklinghausen has made for the Westinghouse interests successful experiments on the purification of water by the use of ultra-violet rays. The process has been tried on a large scale at Marseilles by the Puech-Chebal Company. M. Chebal stated to the writer that the rays had effective penetration of 30 cm. in clear water, and the process was about one-third as expensive as that of ozone. It is proposed to use sterilization there in place of the final slow sand filtration.

In Germany, the English slow sand filter is generally used where surface water furnishes the public supply. At Hamburg the River Elve is used as a supply after receiving the sewage of an urban population of about six million persons. The filters were installed about 1893, after a severe cholera epidemic, and since that time all intestinal diseases have been very low, as shown by the accompanying diagram. Some alum is used to facilitate the sedimentation, which is not naturally effective on account of faulty design of the basins. Prof. Dr. Dunbar, director of the Hygienic Institute of Hamburg, states that the effluent of the plant has been improved since the addition of the alum. The manager of the works says that the improvement is slight and that the work involved in cleaning the beds is nearly doubled. At Bremen, the River Weser is used as a source of supply, polluted enormously. Alum is used there by Director Goetze in connection with his double filtration, and with satisfactory results. The management at Bremen was more intelligent, so that a conclusion that the use of alum in connection with slow sand filters is undesirable or inefficient, drawn from the Hamburg experience, would be erroneous. However, the combination is a clumsy one, and one which should not be recommended for a new plant. In Germany the general tendency is to adopt ground water as a source of supply. The ground supply is usually treated to remove iron. Serious problems are encountered in some cases, although generally the process is simple.

In England the slow sand filter is the usual method of purification adopted. In Birmingham and Leeds, where the supply is taken from upland distant sources, the water is filtered. At Birmingham it is filtered twice, once by means of a coarse sand filter in connection with lime treatment at the source and later at the city reservoirs by slow sand filters operated at rates of about 350 gallons per square yard per day. Neither water is particularly impure; filtration is used as a precaution.

Dr. Rideal, the eminent chemist of London, has been experimenting with hypochlorite recently, and believes that it should be tried in England. Dr. Huston, chemist of the metropolitan water board, has recently been making observations on the removal of bacteria from water by sedimentation which have led him to the belief that sedimentation is the thing which should be tried, that it is a better protection against water-born disease than filtration. This conclusion is certainly limited in its application.

The above account of practice in water purification on the continent and in England shows, first, the marked difference between European and American methods, and, secondly, the great divergence among the methods in use at various water purification plants in Europe. Similar conclusions can be drawn in the field of sewage purification.

SEWERAGE.

In France practically no progress has been made in sewage purification; the now antiquated septic tank is being favored there where any treatment is required. At Paris the immense sewage fields, occupying an area at least equal to that of the city itself, are said by some of the eminent engineers of that city to be quite unsatisfactory. The city of Paris is experimenting in the southeastern districts at Mont-Mesli with many forms and types of percolating filters. Through the kindness of M. Bezault, the writer was able to visit these works. Photos are shown.

In Germany there is no agreement on theory and no uniformity of practice. The principal places visited where sewage purification of disposal were important were Leipsig, Dresden, Berlin, Wilmersdorf, Coepenik, Hanover, Harzburg, Hamburg, Bremen, Essen, Bochum, Recklinghausen, Holzrickede and other cities included in the Empschergenossenshaft (which will be referred to below), Frankfort, Wiesbaden and Cologne.

Leipsig: This city of 600,000 population is situated on a small stream 20 miles above a city of 150,000 inhabitants. The sewerage system empties into this stream, which has a dry weather flow as small as 70 second feet. The volume of the sewage is from 10 to 20 million gallons daily, which is equivalent to a dilution of from 4½ to 9.

Sewage is treated by chemical precipitation and sedimentation only. Experiments are being carried on for the purpose of decreasing the cost. The effluent obtained is considered to be satisfactory.

Dresden: This city of 600,000 population is situated on the Elbe. The sewage of Dresden is discharged into the river unpurified, at many points, at present. The city has been compelled to purify its sewage by the Prussian government. It proposes to do this by screening only. A screening plant has been erected and is nearly ready for use. The screening system employed is the "Rientsch."

Berlin: The great part of the sewage of Berlin is drained to pumping stations, of which there are many in various parts of the city. From these stations it is pumped to the irrigation fields in the outlying districts. The extent of land occupied by these fields is about the same in area as that of the city itself. The process is very expensive and steps are being taken to install artificial beds for purification. One of these artificial filtration plants is in existence at Wilmersdorf, a suburb of Berlin with a population of about 250,000. The sewage is pumped about ten miles and is quite septic when it reaches the plant. The plant consists of septic tanks, where the sewage is held about 24 hours; percolating filters arranged in circular beds and a final settling basin. From these settling basins the water may go directly to the ditch draining territory or it may be allowed to first pass through slow sand filters. Usually it goes direct. The odor from this plant was noticeable a mile and a half away.

Coepenik: This is a suburb of Berlin. The sewage is pumped from the city, a distance of about one mile, to the purification works. At the purification works soft coal is ground and mixed with water and is then added to the sewage, which after flowing through a mixing canal, is run into settling basins. The comparatively heavy coal dust settles rapidly and carries a large amount of the suspended matter of the sewage. The settling basins are drained about once a month and the sludge is removed and transported to the near-by municipal power house. As it consists largely of coal, it has considerable fuel value. It is mixed in the proportion of 3 to 1 of brown coal and burned in the station. For the results obtained, this treatment appears to be very satisfactory. There is no odor about the plant and the effluent is not apparent in the small stream into which it flows.

Harzburg: The sewage disposal plant at Harzburg is interesting on account of the filter, which is of the "Dunbar" type. The peculiarity of this type is the method of distributing the sewage over the surface. The filter is of the percolating type, but the upper 10 inches or 12 inches is of fine material. The sewage, instead of being sprayed over the surface, is run on in pipes from which it flows and through large openings to a fine material. It is supposed to be distributed over the top surface by means of capillary action in this sand or fine material. I was not favorably impressed with this method of distribution, because it did not seem to accomplish its object, some parts of the sand being dry, while others were flooded.

Hanover: The sewage of Hanover flows into a river having a flow of 490 cubic feet per second. It amounts to about 8 million gallons per day. It is run through septic tanks and then directly into the river. These tanks are drained by floating weirs every two or three days. The sludge is pumped into an elevated tank, from which it flows to centrifugal machines, where the percentage of water in the sludge is reduced to about 60 per cent. This process of drying sludge is very expensive and not at all satisfactory.

Hamburg: At Hamburg all the sewage from about 750,000 people is screened and discharged into the River Elbe at one point. The screen house, on the bank of the river, takes up less than 1.8 of an acre. It is a good appearing, substantial brick building, and has the appearance of an office for some of the nearby manufacturing plants. The screen and the screen chamber are below the surface of the ground. The screenings from the sewage as it passes to the river are removed mechanically under cover to a covered scow lying directly in front of the screen house. The scow is filled in two or three days, then it is towed about ten miles down the river, where it is unloaded by farmers and the screenings used for fertilizing purposes. After passing the screen the sewage enters the river through three pipes about six inches in diameter at points about 250, 350 and 450 feet, respectively, from the shore. The water at these various outlets is from 35 to 45 feet in depth. The discharge is upward. There are no deposits near the outlet nor anywhere in its vicinity. Dr. Dunbar, director of the Hygienic Institute in Hamburg, gave our party the use of a launch. We passed directly over and around these outlets, but it was impossible to see any trace of the sewage. There are bathing houses and bathing beaches within a mile below this outlet, crowded with people.

This is one of the best examples of successful disposal by screening and dilution.

Bremen: The sewage of Bremen flows directly into the River Weser without purification. The city is now experimenting with various forms of screens which will be used for the purpose of eliminating about half of the suspended matter.

Essen and Vicinity: The city of Essen is located in the drainage area of the Emoscher river. This territory is one of the most thickly populated in Europe and is also one of the most important sources of coal supply. All of the cities located in this drainage area, together with the management of the Krupp Works, have united their efforts to improve the conditions relating to the control of the river and its tributaries. The sanitary control is of particular interest. A commission called the Empschergenossenschaft has been formed, sanctioned by the royal government, which has absolute power. It may levy taxes for improvements and there is no appeal, even in the courts.

A method of sewage disposal has been developed here which consists of the treatment of sewage preliminary to filtration. The principle of it being that the sewage, while being run through tanks, as is usual elsewhere, is not allowed to remain long enough to become septic. The sediment is allowed to fall into a lower compartment, where it becomes septic and finally "rots out," that is, becomes non-putrescible. This sludge can be drawn off on to sludge beds and allowed to drain without the least offense. It dries in the course of a few days, and after drying resembles peat, both the sight and smell. The effluent from such tanks is in a condition more suitable for filtration than that from septic tanks. The particular cities visited in this district where sewage purification plants were in operation were Bochum, Rocklinghausen, Holzrickede, Rockner-Rother.

Frankfort: At Frankfort there is in existence probably the finest sewerage system in the world. The sewers are built on nearly perfect grades and made as smooth as possible to prevent deposits. These are flushed three times a week by means of movable dams, which are used to hold back the sewage and suddenly release it. The object of this construction and operation is to remove the sewage rapidly and completely to the point of disposal. At the disposal plant, which is perhaps an example of good architecture and beautiful surroundings, the sewage is screened and settled, after which it is run directly into the Rhine river. The centrifugal apparatus mentioned as having been seen at Hanover is also in use here with the treatment of the sludge. It does not produce good sludge and cannot be said to be successful.

Wiesbaden: The sewerage system of Wiesbaden has also been built with great care. There is no odor in these sewers. In one place they are open to the public three times a week, and an admission of one-half a mark is asked and usually paid. They are lighted by electricity and have sidewalks. The sewage is merely screened before going into the Rhine.

Cologne: At this city the sewage is settled and screened before being run into the Rhine. Experimental work of great value on sedimentation has been carried on here, and at present experiments are being conducted to determine the best form of screens.

From the above accounts, the statement made at first in regard to nonagreement either in theory or practice in the two principal problems of sewage purification, namely, the production of a stable effluent and the production of a non-offensive, easily handled sludge, is apparently true. There is no satisfactory general control of sewage purification in the German Empire. In Prussia, the Royal Testing Laboratory exercises advisory powers over Prussian streams, but is a body made up of laboratory men almost entirely, and which, on account of failure to grasp the financial and practical aspects of the questions involved in the individual cases, is severely criticised by many of the leading experts.

Dr. Dunbar, of Hamburg, who is a leading authority on sewage purification, and Dr. Imhoff, of Essen, who now is the leading exponent of preliminary methods of sewage treatment, both have serious differences of opinion with this official body. Dr. Imhoff is engineer for the Empschergenossenschaft, which is a commission having absolute powers in the sanitary control of the rivers and waters of the drainage area of the River Empscher,

This method of control of streams, namely, by drainage areas, is also in vogue in England, and seems to be a very satisfactory way of managing the problems peculiar to each locality. In Germany and in England, both very thickly populated, the attempt to purify the sewage merely to the point where it will not be offensive to the sight or smell, nor be destructive to fish life, and where it does not contain enough of solids to silt up the river beds, is universal. The instance of the Elbe taking the sewage, in many cases merely screened, of 6,000,000 people and then being used without injury by the inhabitants of Hamburg as a public water supply is very instructive.

At Hamburg, also, the sewage of approximately one million persons goes continuously and directly into the River Elbe with screening only, and no trace of it is noticeable. It is discharged through a submerged outlet in the main current of the stream, a practice which should obtain in the Twin Cities, especially in certain of the sewers of Minneapolis. It is probable that in this city, with such an arrangement, no purification other than mere screening will ever be necessary. Screening and dilution are methods common in the large streams of Germany.

In the Empscher district the tanks used for sludge removal or some modification of them are certain of considerable use in this country in the near future. The Travis hydrolytic tank, in use at Norwich, Eng., is a predecessor of this German tank, and one possible of considerable modification. The Imhoff tank is patented in Germany and the United States, but the validity of the patent is open to doubt, on account of its being a possible infringement of the Travis patent.

Aside from this question, however, both systems show a great advance on the old septic tank. Nowhere were septic tanks found which could compare in results obtained with the Imhoff tanks of the Essen district. The septic tank is a "back number."

The average rainfall in Europe is perhaps less than that of Minnesota, at any rate, not greater. The streams are generally smaller, both on account of small rainfall and small collecting areas. The population is of far greater density. Notwithstanding these conditions, sewage is discharged with very little purification into streams which in many cases are used as water supplies. Even from streams so polluted, satisfactory water supplies are obtained. In America, with the less expensive and more efficient means of purification of water, the larger streams and lesser density of population, it will be many years before the problems of river protection will be as acute as these of Europe.

However, by taking proper steps at the present time, unpleasant conditions of conflicting interests can be largely avoided. There is in every stream some power of purification, varying in each one. In order to know what this is, regular observations over considerable lengths of time are usually necessary. Only with such data as proper observations will furnish is it possible to wisely determine the proper design of sewage purification works when such are necessary. Therefore, as a basis of future sanitary regulation of streams and lakes, some regular observation of their condition should be commenced, and the sooner the better. This work, of course, would be done by the laboratory division, but the engineering division should be in close touch with the progress of such work at all times, so that proper and intelligent reports on works for purification of sewage or water may be made without undue delay.

It was impossible in the limited time to observe closely the practice in the sanitation of public buildings. Necessarily on account of the differences of climate, heating and ventilating practice would be widely different in Northern United States and Europe.

It is the writer's impression, however, that there is little to learn on account of the difference in climatic conditions. As has been mentioned above, the possibilities in the use of ozone for air purification seem worthy of investigation, and where funds are at hand some interesting experiments could be carried on to determine the various factors of the problem. The harmful element in the impure air of school rooms and public halls is the very minute quantity of organic effluvia from the bodies of occupants.

This would require but little of an oxidizing agent to reduce it to mineral matter. The carbon dioxide is, of course, within ordinary limits, up to 50 to 100 parts per 10,000 perfectly harmless for short periods, but if it be allowed to rise to only 25 or 30 parts, and at the same time the organic matter of the air is oxidized, an immense economic advantage would be gained in a climate as cold as this, and in a territory where the increasing cost of coal will make it each year more difficult to secure proper amounts of fresh air in buildings during the cold winter months.

Mr. Gerard, of Brussels, has applied this principle in some of the principal bank buildings there, both for the purpose of improving the air for breathing and of destroying mold and bacterial growths, which tend to destroy the records. It seems a promising field.

The most impressive thing about European public affairs is their stability, a quality which gives public servants a better standing and enables them to plan carefully and execute efficiently and economically the duties of their offices through a term of years. The importance of public health is better recognized and the organization for its maintenance is correspondingly more perfect and is vested with more authority.

DIRECTOR.

APPENDIX V.

MINNESOTA STATE BOARD OF HEALTH.

REPORT OF THE WATER WORKS AT....................................
..............................19...... Reported by..................................
City or Village..................Est. Pop.............Chief Industry.................
Approx. No. of Houses..............Does the Town Appear Prosperous?............
W. W. Owned by..................Are W. W. and E. L. Plts. Combined?...........
Rec. of Change of Ownership..
....
Name of W. W. Supt.......................................Salary, $.............
Is Work Done by Contract?...............If Not, How?..........................
....
No. of Councilmen..............Name of Mayor....................................
Condition of Records and Files in Some Detail....................................
....

DISTRIBUTION SYSTEM.

Sizes of Mains and Valves....4 in....6 in....8 in....10 in....12 in....14 in....16 in.
No. Ft. of Each Size Main..
No. Valves of Each Size..
Total No. of Miles of Main.............No. Miles of Main per 1,000 Pop............
No. Valves per 1,000 Pop......................Per Mile of Main....................
Make of Valves...
Total No. of Hydrants................Make.....................Size...............
Hose Conn.....................................No. Thrds. per In..................
Total No. Hydrants.........................
No. Hydrants per 1,000 Pop..................No. per Mile of Main.................
Pressure at Hydrant in Case of Fire..................................Pounds.
Notes..
....
....

MINNESOTA STATE BOARD OF HEALTH.

Name of Town..

SOURCE OF SUPPLY.

Name of Lake or River..
Size...............Sq. Mi. Depth, Max..............Ft. Min...................Ft.
Area of Watershed in Sq. Mi...................Surface of Watershed...............
....
Wells, Number........................Distance Apart..........................Ft.
Driven or Dug................Depth.................Ft. Diam.................Ft.
Curb of Casting..
General Sanitary Surroundings..
Sources of Possible Contamination..
....
Est. Cap. of Source in Gal. per Day, Max...................Min.................
....
Distance from Surface of Ground to High Water Mark........................Ft.

Distance from Surface of Ground to Low Water Mark..........................Ft.
Intake, Size of Pipe.........Inches.......Distance of Intake from Shore.........Ft.
Depth of Water at Intake............................Feet.
Distance of Intake from Bottom of River, Lake or Well.......................Feet.
Springs, Number..
Size of Collecting Works...
Capacity of Collecting Works..............................Gallons.
Notes..
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MINNESOTA STATE BOARD OF HEALTH.

Name of Town...

PUMPS AND PUMPING ENGINES.

Make...
Type...
Date of Installation.....................Capacity...............Gal. per Min. (rated)
Size..
Diam. of Suction Pipe................Inches. Lift................Feet.
Diam. of Discharge Pipe................Inches.
Pressure Pumped Against Domestic Tank Full............lbs., Fire..............lbs.
Valves: Suction, Size..............Type......................Number..............
Discharge, Size............Type......................Number..............
Air Chambers: Capacity, Suction Side..........Gal. Discharge Side..........Gal.
No. Strokes per Min., Fire.................... Domestic...................
No. Gal. per Min., Fire.................... Domestic....................
No. Hrs. per Day Pump is Run, Summer..................No. Gal. Pumped per Day ....Max...................Min.
No. Hrs. per Day Pump is Run, Winter...................No. Gal. Pumped per Day ....Max...................Min.
Governor..
Steam Pressure Used................lbs. Slip............% Efficiency............%
Cost of Pumping, per Day, Summer, $................ Winter, $................
Cost of Pumping per 1,000 Gal., Summer, $.............. Winter, $..............
Cost of Pumping One Million Gal., One Foot High, Summer, $...................... Winter, $.....................
Cost of Pump, Installed, $.....................
No. of Engineers and Their Employes......................Salary, $................
Notes..
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MINNESOTA STATE BOARD OF HEALTH.

Name of Town...

TANKS.

Elevated or Pressure...
Material of Tank.........................Material of Tower..................
Bottom of Tank..........................Height of Tower.....................Feet.
Diam. of Tank......................Feet. Height of Sides......................Feet.
Thickness of Plates..
Capacity..Gals.
Elevation of Bottom Above Pump Cylinder........................Feet.
Elevation of Bottom Above Business Streets......................Feet.
Date of Installation..Cost, $................

TAPS.

Number of Houses Tapped................Per Cent of Houses Tapped..............
No. Taps per Mile of Pipe....................Per 1,000 Pop......................
Size of Service Pipe.......................Inches. Material.....................
Amount Consumed per Tap per Day..............................Gallons.
Amount Consumed per Capita per Day...................Gallons (Total Population)
Meters, Number......................Per Cent of Taps Metered.....................

SCHEDULE OF RATES.

Hydrant Rental, $..........................Sprinkling, $.........................
Other Public Uses, $..........................

	FLAT.	METER.
House Service per Year, - -	$............	
House, No Closet or Bath, -	$............	........................$............
Closet, - - - - - - - -	$............	........................$............
Bath, - - - - - - - -	$............	........................$............
Each Additional Room, - -	$............	........................$............
Lawn..........Foot Lot, - -	$............	........................$............
Lawn, Each Add.......Ft. -	$............	........................$............
Business Houses, - - - -	$............	........................$............
Saloons, - - - - - - -	$............	........................$............

Notes..
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MINNESOTA STATE BOARD OF HEALTH.

Name of Town..

SEWERAGE SYSTEMS.

Sanitary?.................. Storm?.................. Combined?..................
Separate?............In Same Trench?............Which Pipe is Above?............
In Same Trench With Water?..................Kind of Soi.?........................

COMBINED OR SANITARY SYSTEM.

Sizes of Pipe...............6 in......8 in......10 in......12 in......14 in......16 in.
No. Ft. of Each..
Sizes of Pipe...18 in......20 in......22 in......24 in......26 in......28 in......30 in.
No. Ft. of Each..
Grades: Max.................... Min.................... Ave....................
Depths: Max.................... Min.................... Ave....................
Spacing of "Ys"..................Ft. Ave. Spacing of Houses..................Ft.
Flush-Tanks: Capacity............Gals. Frequency of Discharge............Hrs.
Purification: Cap. of Septic Tank....Gals. Cap. of Septic Tank per Capita....Gals.
Outlet: Name of Lake or River...
Size of Lake or River...............Is End of Outlet under Water?...............
Elevation of Outlet Pipe Above Water........................Feet.

STORM SYSTEM.

Sizes of Pipe:.......6 in.......8 in.......10 in.......12 in.......14 in.......16 in.
No. Ft. of Each..
Sizes of Pipe:.....18 in.....20 in.....22 in.....24 in.....26 in.....28 in.....30 in.
No. Ft. of Each..
Grades: Max.................... Min.................... Ave....................
Depths: Max.................... Min.................... Ave....................
Outlet: Name of Lake or River...
Size of Lake or River...............Is End of Outlet Pipe Under Water?..........
Elevation of Outlet Pipe Above Water...............................Feet.
Notes..
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APPENDIX VI.

Mankato Typhoid Epidemic.

PART 1.

The city of Mankato had until the summer of 1908 been practically free from typhoid. Any sugestion that there was danger from a polluted water supply would have been dismissed as visionary. But on June 27, 1908, an epidemic of diarrhea affecting over half of all the people swept over the city. It caused considerable alarm and an investigation was made by the State Board of Health; the engineering division of the Board made an examination of the wells and their relation to possible sources of contamination.

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Closet,
Bath,
Each A
Lawn. - -
Lawn,
Business
Saloons,
Notes. - -
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Name of

Sanitary
Separate
In Same

Sizes of
No. Ft.
Sizes of
No. Ft.
Grades:
Depths:
Spacing
Flush-T
Purificat
Outlet:
Size of
Elevatio

Sizes of
No. Ft.
Sizes of
No. Ft.
Grades:
Depths:
Outlet:
Size of L
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Heavy rains in the early summer had caused the highest water in the Minnesota river since 1881. The crest of the flood was reached June 25, and on this date there occurred in Mankato an extremely heavy rain. the run off of which from the precipitous slope immediately east of the city, flooded several streets to a depth of over one foot for their entire width. Washington Avenue was one of these streets.

Fig. 2. shows these wells in some detail. The McCarthy well, is of recent construction and probably did not contribute to the disaster. The "old well" was sunk some twenty years ago and both the overflow to the sewer and the suction pipe were badly corroded. Holes of 1½ inches in diameter entirely through the pipe were found in both. I saw one of these plugged with a poorly fitting piece of wood. The sewage from the sewer immediately beneath this well pit certainly backed up into the pit and as surely was drawn through the holes in the suction pipe to the pumps and distributed.

The Front Street well was of recent construction and in good condition, no contamination from it was possible.

The Second Street well was of recent construction and in good condition, When first found by the writer, this well pit was filled with water to a point within four feet of the surface of the ground, and the lower outlet to the sewer was dimly visible through the still turbid water. It was obvious from the debris in the crevices between the brick side walls and plank covering that the water in the pit had been as high as the surface of the ground.

A curiously placed pipe in an inclined position which appeared to be a branch of the well casing occupied the center of the pit. No one in Mankato could tell what this pipe was, although many guesses were hazarded; later a workman stepped upon it and it rolled to one side. This incident is mentioned to bring out the remarkable fact that previous to the epidemic absolutely no one was familiar with the construction of this well. Later upon the subsidence and clarification of the water in this pit, it was found that the supposed top of the well casing was in reality but one end of the vertical arm of a T, the other end terminating a foot or more above the bottom of the pit. It is absolutely certain that the sewage backed up into the pit. Near-by manholes show that the sewage backed up to within eighteen inches of the surface of the street or about six feet above the bottom of the pit. Thus sewage was pumped directly into the water mains of the city.

At the outlet of the sewer passing the Broad Street well was a large manhole or pump-pit, divided into two parts by a well at right angles to the line of the sewer. In the upstream division of this pit was a small centrifugal pump which at the time of high water pumped sewage over the top of the wall. At ordinary stages of water in the river, the sewage flowed directly through a gate in the wall. At the time of this flood, the pump was unable to handle the large quantity of sewage coming to it, hence the backing up into the system of pipes in the city.

The engineer of the pumping station was notified of the appearance of sewage in the engine rooms of a near-by flour mill by attendant at the latter place. The gate in the dividing wall of the well was opened and the danger was supposed to be over. However, the unusual appearance of the city water supply was soon noticed and the president of the board of public works was notified by the health officer of the city. He refused to stop the pumps as there was not sufficient water in the reservoir for emergency in case of fire.

When the pumps were not running, it was customary to allow the overflow of the Broad Street well to run through the suction pipe, which sloped downward toward the pumps, through the pumping station to the river. There is some uncertainty as to the exact time when the gate in this pipe was opened, but during a certain period the sewage was high enough on the lower side of the gate to allow it to flow back into the suction main in considerable volume. There is evidence to show that this must have occurred, since the sewage backed up to the boiler room floor and its route thence was through a manhole into which the above mentioned suction pipe discharged.

All of these conditions making possible the contamination of the water supply were unknown to the city council, the board of public works, to the health commissioner or any one else.

Mankato citizens prided themselves on their supply of pure water, but their assurance was founded on mere assumption and a terrible calamity resulted.

No one in particular was to blame; the form of government which divided the responsibility and the lack of appreciation of the need of care in obtaining and maintaining proper sanitary conditons was the underlying cause.

Such conditions now probably exist in more than one Minnesota city. The engineering division of the State Board of Health should be in a position to examine regularly all sources of water supply. Such inspection is at least of as much importance to life and property as the inspection of steam boilers which are regularly inspected.

PART 2.

Reconstruction:

A double object was held in view in making repairs both to increase the capacity of the supply and to make the pollution of the water impossible.

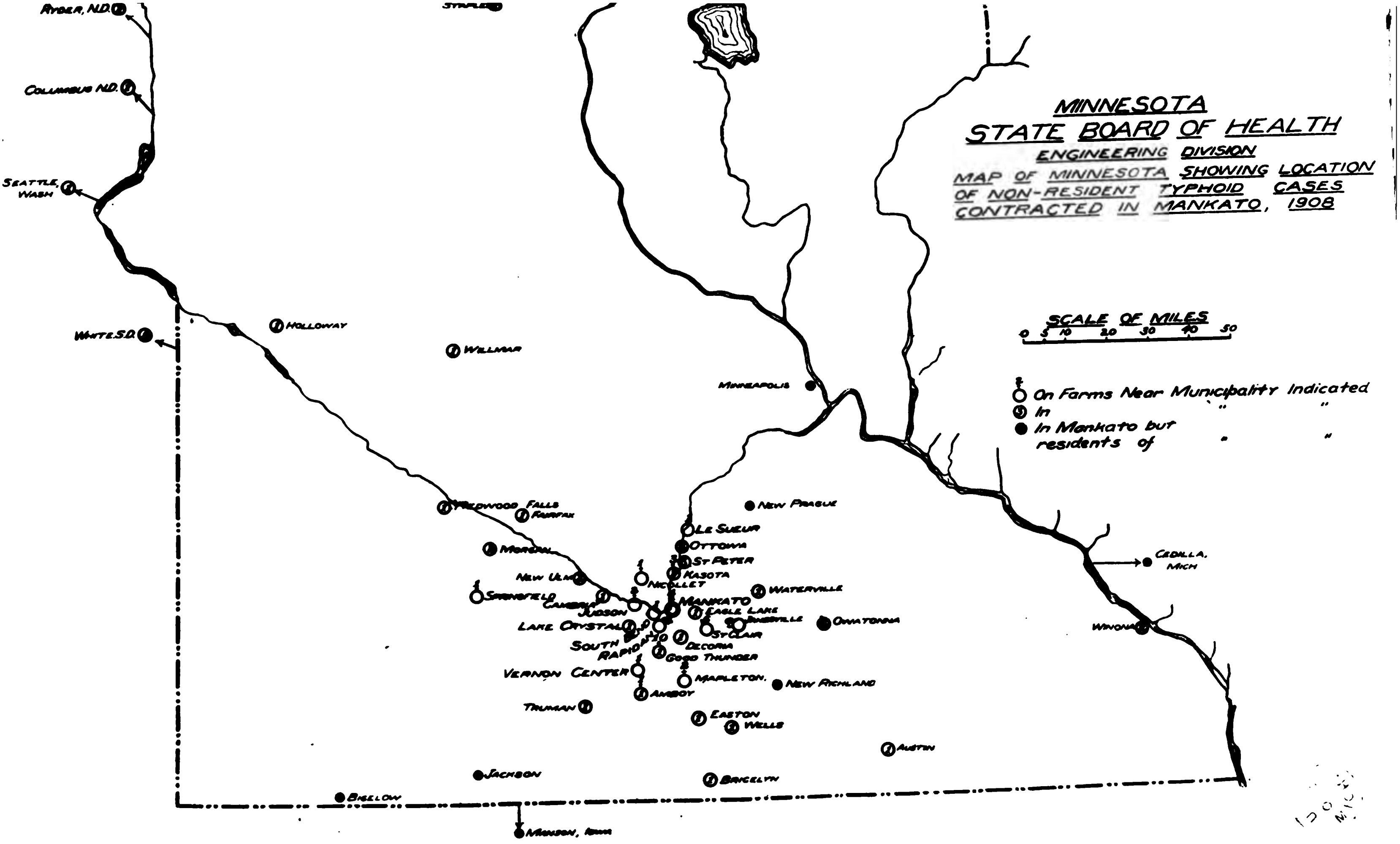
The first step was to rebuild the "old well." This well was of 8-inch bore with a 10-inch casing to the rock at a depth of 130 feet. The well was reamed out to a diameter of 10-inches; and 8-inch casing with a rubber packer was placed inside of the 10-inch casing and a tight joint made with the rock. An old uncompleted well was also found at the manhole. At the surface it was fitted with a goose neck extending above the highest possible high water level in the river and then run to the river to provide for any occasional overflow.

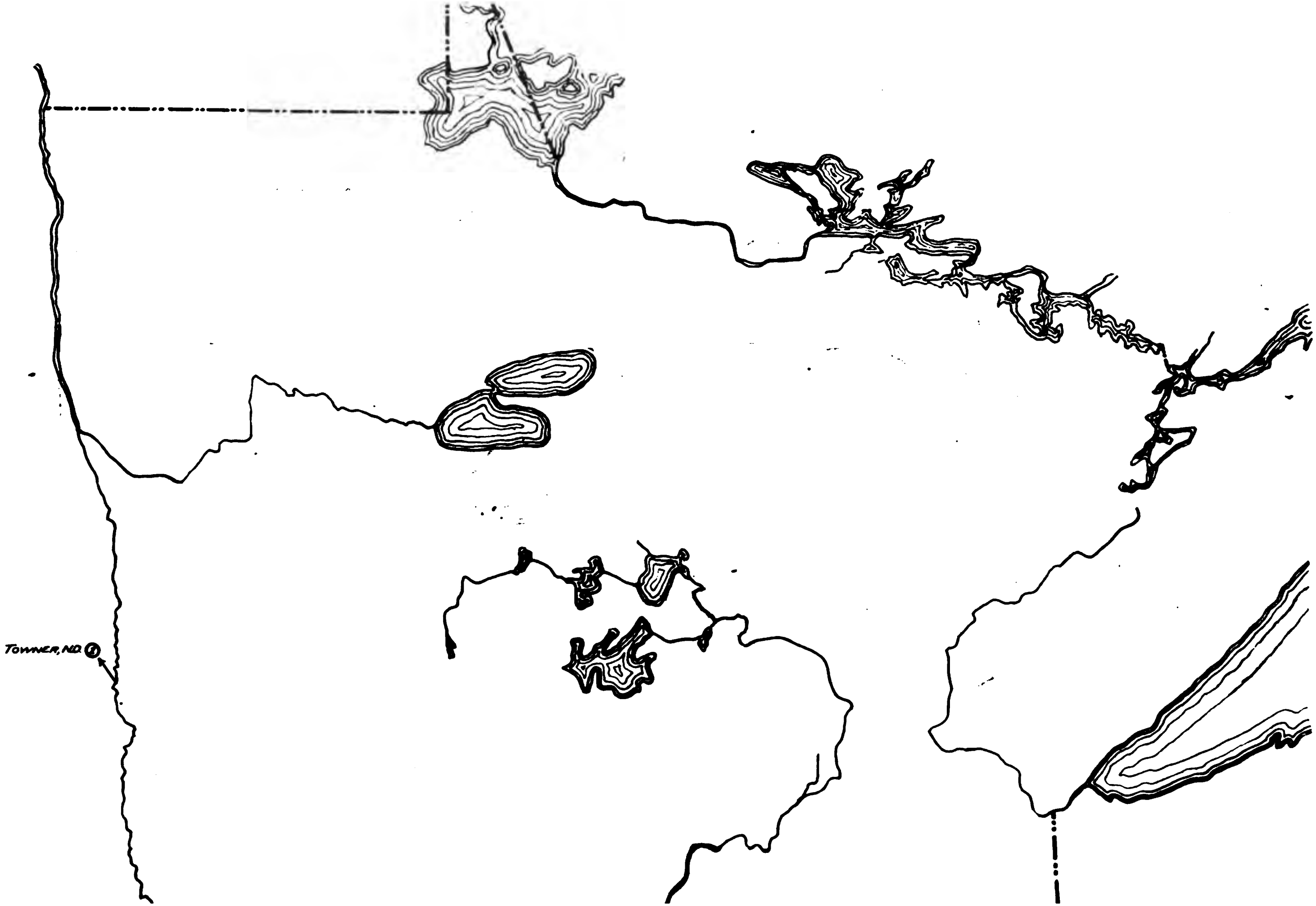
The second operation was to determine the exact location and condition of suction mains. These were found to be overflows or drains from the wells to the pump rather than true suction mains; the pumps would not operate until there was about three pounds pressure from the wells, hence the full capacity of the wells could not be realized.

All pipe near the pumping station was found to be of wrought iron and in bad condition. There were many holes extending through the pipe and several joints entirely rusted through, the main from Broad Street to the pumping station had many leaks. This old main was torn up and relaid on a grade of 0.10% upwards towards the pumping station. Flanged pipe of 12-inch in diameter from the pumping station to Front Street, 10-inch in diameter from Front Street to Broad Street was used. The old cast iron pipe from the pumping station to Front Street was in good condition but from Front Street to Broad Street there were found 28 breaks, in two places the pipe had broken off entirely. In one break it had been attempted to mend the pipe by wrapping canvas around it. A cold chisel could be driven through the pipe at one blow.

The connection to Second Street well was lowered to increase the flow and a water-tight manhole was built.

MINNESOTA
STATE BOARD OF HEALTH
ENGINEERING DIVISION
MAP OF MINNESOTA SHOWING LOCATION OF NON-RESIDENT TYPHOID CASES CONTRACTED IN MANKATO, 1908




TOWNER, ND ①

The Broad Street well was reconstructed. The old bore hole could not be exactly located because the well casing had been long since corroded. A length of old smoke stack had been put in around this casing and evidently packed with flax seed. Also a length of cast iron pipe which had evidently been used at an attempt for repairs, was found. After making numerous attempts to locate the well in the rock 90 feet below the surface, a new well was put down. A 20-inch pipe was put down to a depth of 4 feet into the rock and a 10-inch pipe was put inside of this. The space between these two pipes during construction was filled with fine sand. Eighty-six cartloads were used in all. The water during the sinking of this well was coming up on the outside and the purpose of putting the sand inside was to allow it to pass down around the lower end of the pipe and be carried up by the water to stop the flow on the outside. This expedient succeeded; after a while the water came up inside the 10-inch pipe which was then driven to a depth of 4 feet below the 20-inch pipe. Finally the space between the two pipes was filled with cement mortar making a cement pipe which would always be in place after the destruction by corrosion of the iron pipes. A concrete manhole was constructed around this well. The bottom was left open and covered with sand so that if the old well should by any chance break out it would come up through the manhole and make itself evident. The reconstructed wells are shown in Fig. 2.

After this, the suction main on the McCarthy well was lowered and cast iron pipe substituted for the wrought iron pipe.

Changes in the suction pipes in the neighborhood of the pumping station were made as indicated in Fig 3.

After this, the cross connection from the main sewer to the drain from the pumping station were cut off.

Lastly, a new sewage pumping station was built and in it were installed an 18-inch centrifugal pump geared to a 65-H. P. motor capacity 10,000 gallons per minute, and an 8-inch pump geared to 15-H P. motor capacity 1,000 gallons per minute. Both of these pumps were designed to operate against a 20-foot head. This new construction is shown in Fig. 4.

All of this reconstruction was under the direct charge of Mr. John Wilson, city engineer of Mankato, a graduate of the Engineering College of the Minnesota state university.

The location of wells, suction mains and sewers on Washington street is shown in Fig. 5.

Fig. 6 is a map prepared to show graphically the extent to which the epidemic spread outside of the city of Mankato.

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